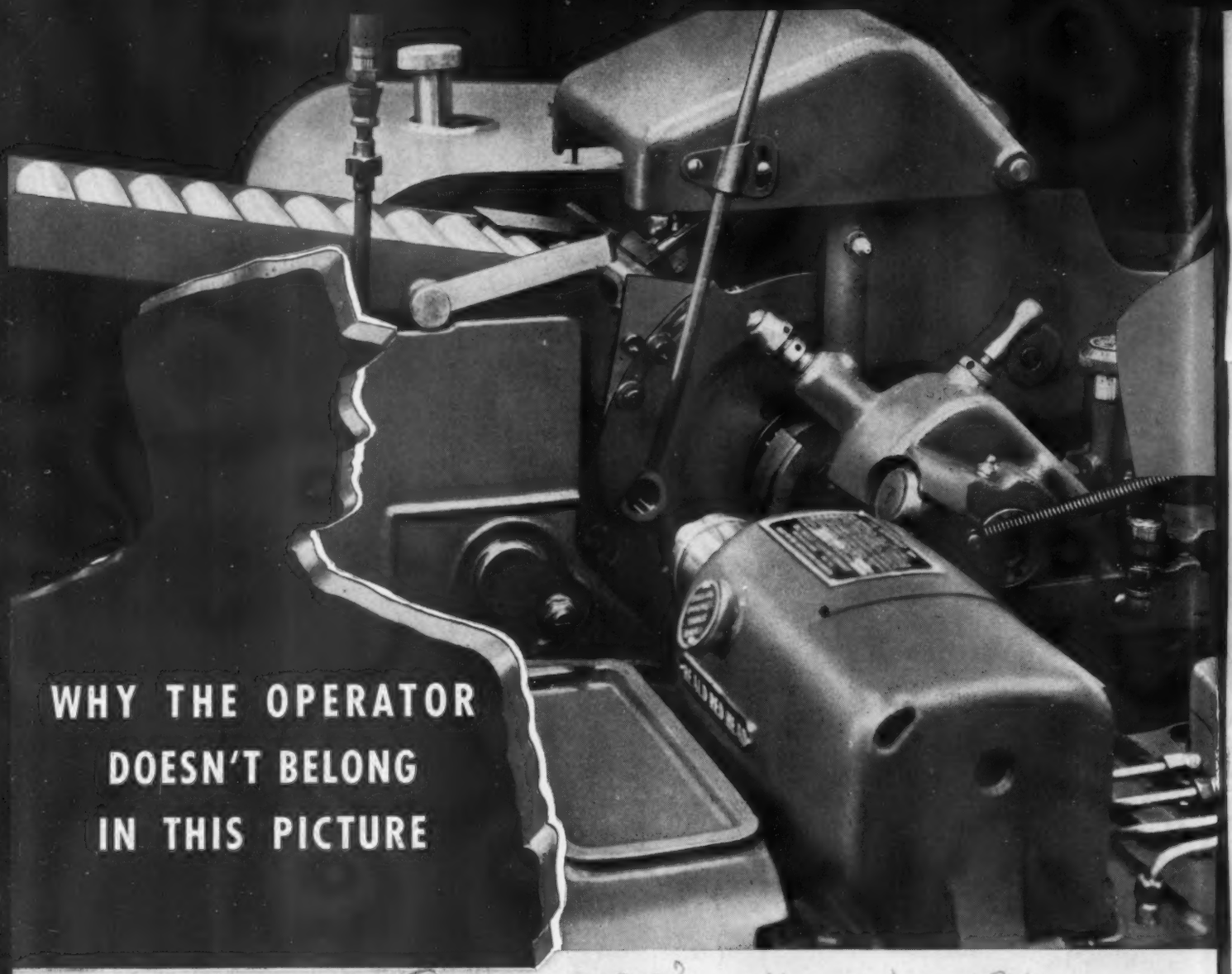
American
Machinist
MARCH 14, 1946
Featuring HYDROPRESS BLANKS BOILER PLATE



TR v.90² Mar - Apr. 1946

Another example of how Heald engineering helps you to cut costs—automatically!

In showing you this close-up of the Heald No. 81 Centerless Grinder, we've purposely left the operator out of the picture. Because in any internal grinding operation that requires both fine precision and high speed production, the operator is the *least important factor* when you use the Heald 81 Centerless.

Operation of this machine involves nothing more than placing the work in loading chutes. The machine does everything else. Loading, unloading, and even size control are *completely automatic*. One operator—and an unskilled one at that—can handle as many as six machines at once.

The Heald 81 Centerless will give you greater accuracy, too, with fewer rejects. Perfect concentricity is assured by the Centerless method of generating the bore from the outside diameter. Hole size is automatically held to tolerances of ten-thousandths by the Heald Size-Matic or Gage-Matic method.

On all types of work having a finished cylindrical O.D. up to 4½ inches—with straight, tapered, interrupted, open or blind holes—the Heald 81 Centerless will do the job faster, more accurately, and with less supervision.

This is typical of the kind of engineering that can easily mean the difference between profit and loss on any production line, especially in these days when so many other factors are beyond your control. At no obligation, a Heald engineer will gladly study your problem to help you get better production at lower cost. For details, write: The HEALD MACHINE COMPANY, Worcester 6, Mass.

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MAGAZINE OF METALWORKING PRODUCTION

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R v. 90a Mar. - Apr. 1946

Clips

Hydraulic Blanking . . . Our cover Kodachrome was taken by Caterpillar Tractor Company at our suggestion. Steel plate up to ⅞ in. thick is blanked in a 3500-ton HPM hydraulic press, with the assistance of a 1000-ton die cushion. For details, see the lead article in this issue.

Tool Engineers Please Note . . . Ever hear of a "slanted" article—one aimed at a particular group? Most of our feature editorial articles for the next issue are slanted—in observance of the ASTE Annual Meeting and Show—to the particular interests of tool engineers and their bosses, but is jam-packed with ideas for our other readers too. The Shop Equipment News section illustrates and describes equipment being shown for the first time at the Show—bringing the newest in tools to those who can't get to Cleveland. That's practical slanting with a purpose; we're not filling vital pages with the traditional lists of exhibitors and their booth attendants, floor plans, programs and "ghosted" statements from officers. All *that* is available at the Show, and to our mind serves no useful purpose for those who can't go—and who've laid their money on the line for useful editorial material.

What's Coming . . . Leading the next issue is a factual description of redesign of the Republic *Seabee* amphibian to cut tooling costs and number of parts 75%, labor costs 92%, and to raise passenger capacity from 3 to 4. You may not make airplanes, Brother, but figures like that outshine Betty Grable's in our business. Also included is the first half of Eitel's description of the justly famous AC Sparkplug training program for tool engineers. That's required reading too. Then there's our second 16-page "War Turns A Page . . ." report, this time on machining; an expert's discussion on practical operation of a jig borer, and . . . . but wait a fortnight, and decide for yourself.

Lowdown on Tool Steels . . . We're proud of the analysis of tool steels on pages 107-112. We don't like to publish articles over four pages long, but this one is worth the extra space. It diagnoses tool steels as compactly as data sheets. The author, pictured below, is a real authority and a well-known technical lecturer and writer on metallurgical subjects. After graduation from Columbia (M.E., 1915), he was metallographist for Remington Arms for two years, then chief metallurgist at Halcomb Steel until 1930. Since then he's been on his present job. He's a past chairman of the New Haven and Syracuse chapters, ASM, also a past National Trustee of the society, as well as a committee member ASTM, and a member of the AIME, AISI and the British Iron & Steel Institute.

Rejuvenation . . . We're having our face lifted—progressively—one wrinkle at a time. Last issue it was the contents page, this issue this page and the first page of the News. Like 'em?

"How To" . . . Order . . . We learned from the first of our "How To" special reports—on lubrication—to anticipate a snowstorm of requests for reprints, so we've provided a reasonable supply of copies of the section on stainless steel. They're available by addressing the Editor, American Machinist, 330 W. 42nd St., New York 18. N. Y., at 10 cents for the 20 pages. Considering the authority and the agony involved in their production, that's a steal. Some 4500 copies of the Lubrication Report were ordered in advance and better than 3000 have been requested since—by better than twoscore companies. We'd proudly print the list if space permitted, because it's an Industrial Register, including major lubrication companies who know their stuff on oils.

In Dutch . . . J. G. deGroot, Gordelweg 209A, Rotterdam, Holland, writes that most of his technical library is gone with the bomb-blasts, asks for bulletins on metalworking machines, electric and gas welding equipment, engines, etc.

PORTRAIT OF THE WEEK

S. C. Spalding, metallurgical engineer, The American Brass Company, and author of the article, "Why Tool Steels Do Not Act Alike," was chief of the Section on Tool and Die Steels, Stainless Steels and Hard-Facing Materials, Steel Division, WPB, from 1942-44.

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CINCINNATI CIRCULAR MILLING ATTACHMENTS ON STANDARD MILLING MACHINES —

ADD A ROTARY FEED MOTION

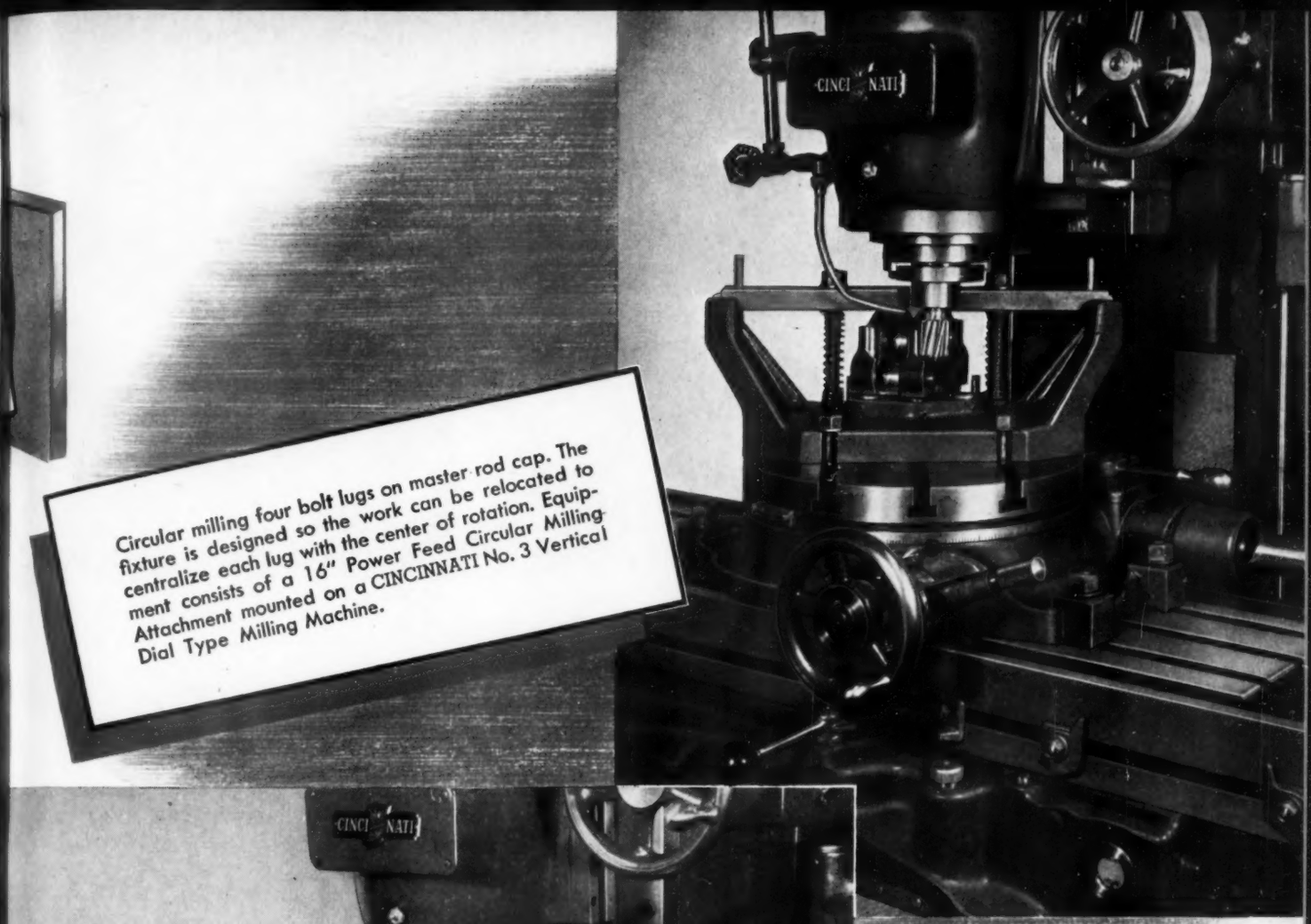
CINCINNATI Circular Milling Attachments add a rotary feed motion to standard knee-and-column type millers, greatly increasing the variety of operations which may be assigned to the machine. For example, four types of rotary or circular milling operations may be handled: 1) Corners rounded to match two straight sides; 2) segment of a circle; 3) concentric diameters or segments of a circle; 4) multiple off-center diameters. Then, too, small parts, held in one large fixture or in small individual fixtures, may be equally spaced around the periphery of the table for continuous milling. And, with the addition of index equipment, large gears can be cut on horizontal machines using the vertical feed. Illustrations on the opposite page show two types of circular milling operations.

¶ CINCINNATI Circular Milling Attachments are available in 16", 20" and 24" sizes; power feed or hand feed. Complete information may be obtained by writing for publication No. M-1035-1.

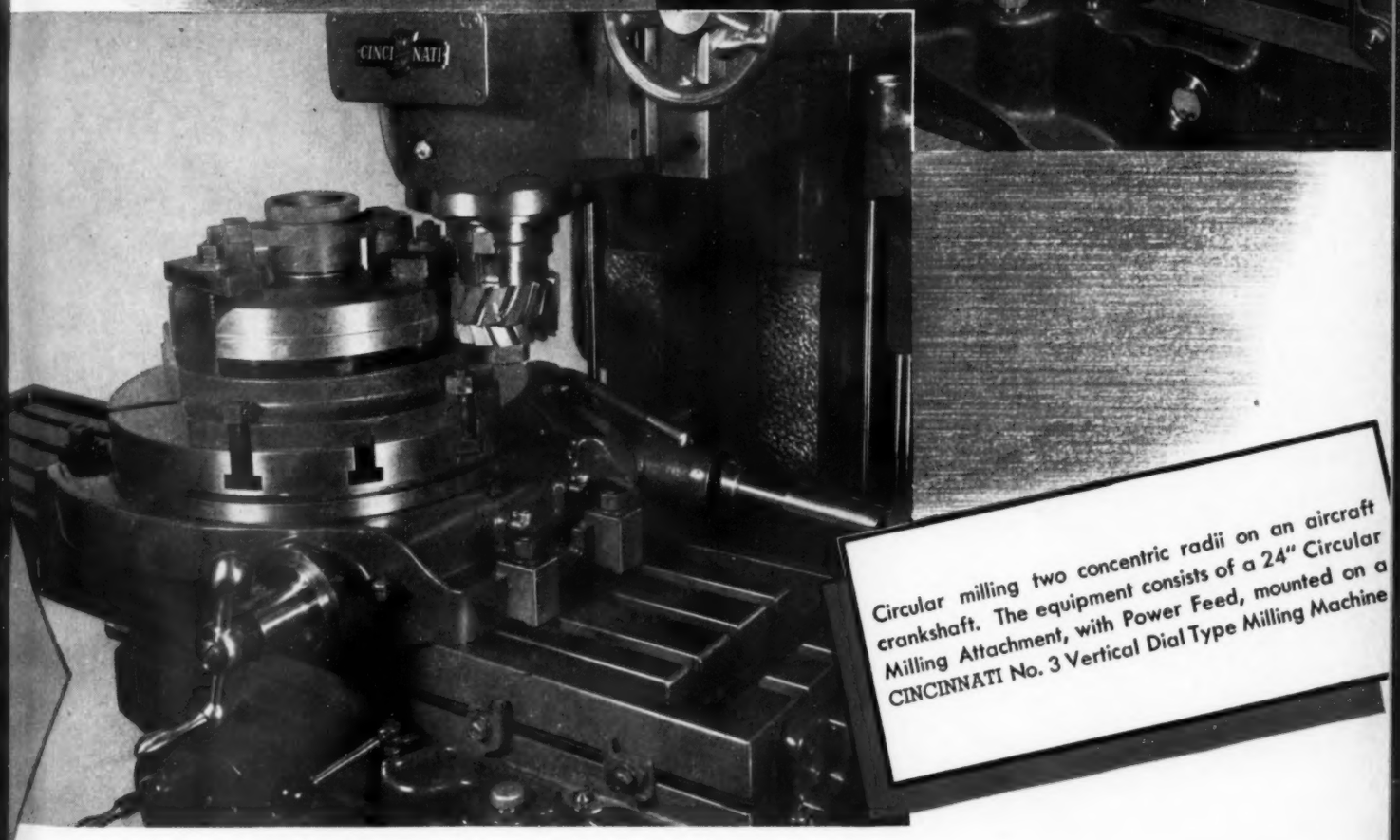
CINCINNATI

THE CINCINNATI M

MILLING MACHINES



Circular milling four bolt lugs on master rod cap. The fixture is designed so the work can be relocated to centralize each lug with the center of rotation. Equipment consists of a 16" Power Feed Circular Milling Attachment mounted on a CINCINNATI No. 3 Vertical Dial Type Milling Machine.

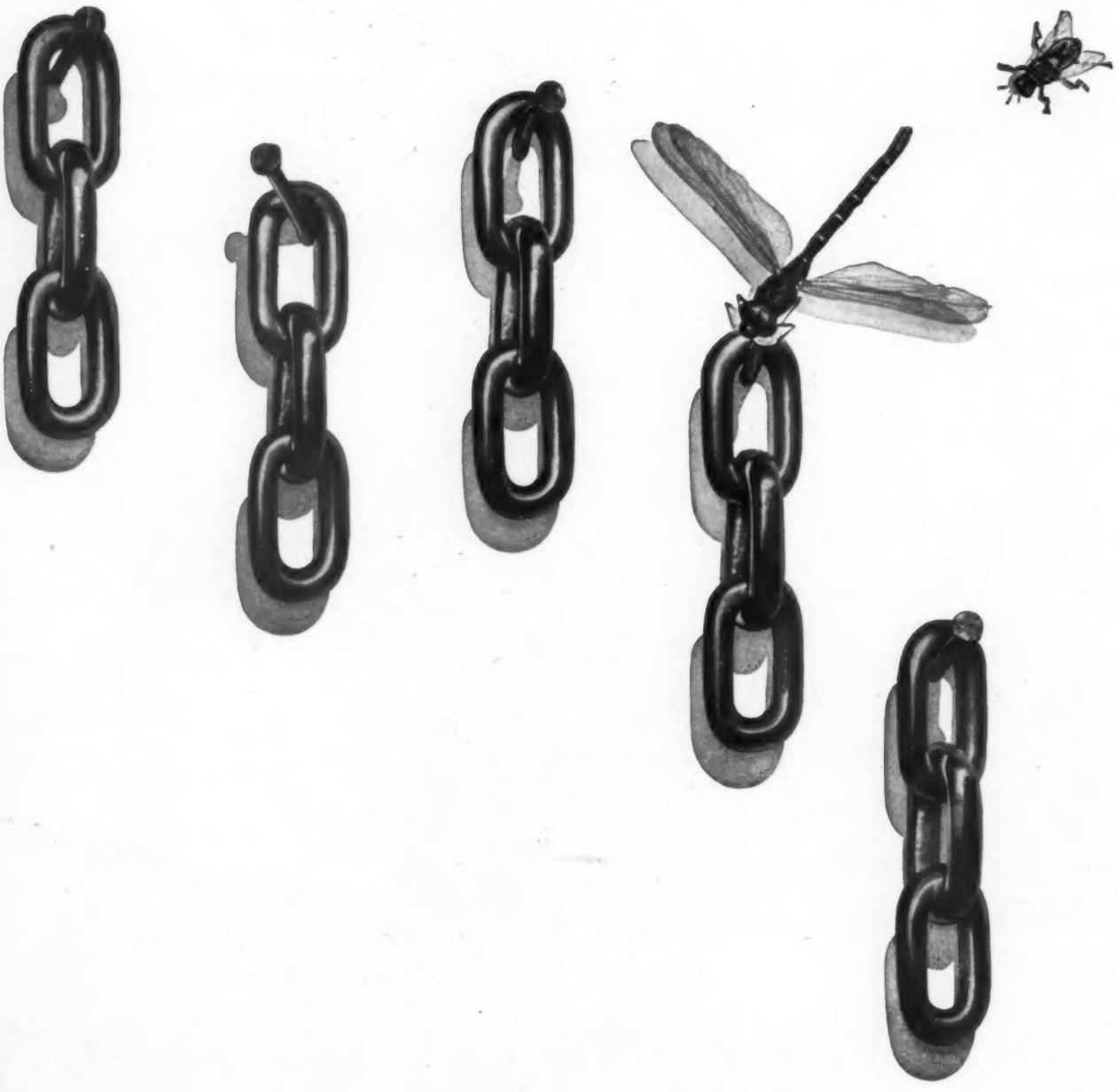


Circular milling two concentric radii on an aircraft crankshaft. The equipment consists of a 24" Circular Milling Attachment, with Power Feed, mounted on a CINCINNATI No. 3 Vertical Dial Type Milling Machine

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

The Great CHAIN



PUZZLE

If it costs 1 cent to break a link, and 2 cents to weld it again — what is the least you should have to pay for a single length of chain composed of the five segments shown here?

Twelve cents? Try again — the correct answer is less.*

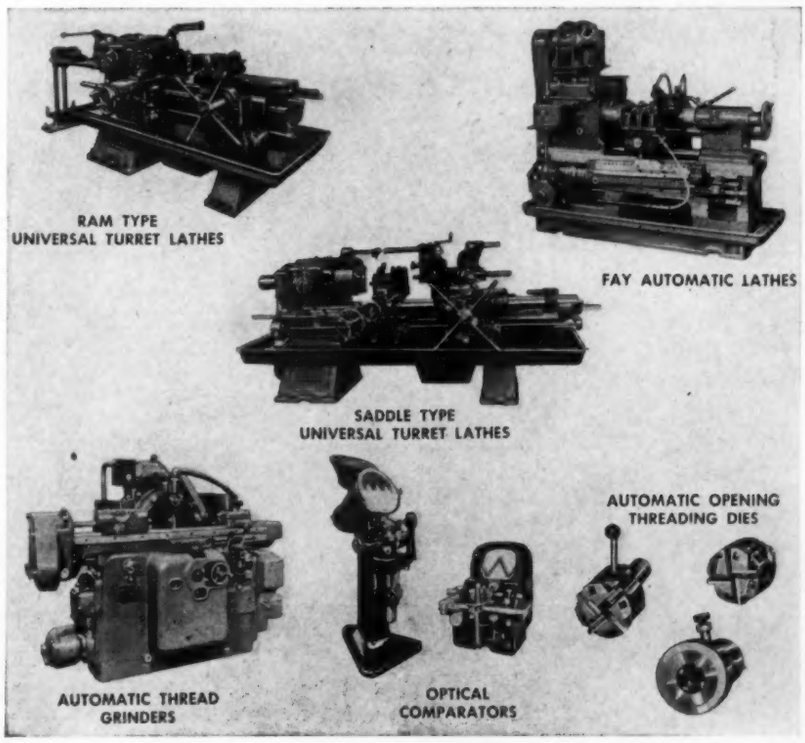
There's a simple moral to this: The obvious way is not always the most economical way.

In the intense competition that lies ahead, costs will make the difference between many a success or failure. Because of this, it will pay you to check *now* on the production efficiency of all metal turning equipment in your plant — and to replace it, if need be, with good War Surplus Machines or new machines.

For carbide cutting tools can remove metal from 200 to 500 per cent faster, and there are cases in our files of savings amounting to hundreds of dollars a month on the manufacture of a single part, by the use of Jones & Lamson machines designed specifically for the most efficient use of these tools.

Send for our book, "Welcome to You and Your Problem" — or better, telephone or write today, and a Jones & Lamson engineer will be glad to call and help you.

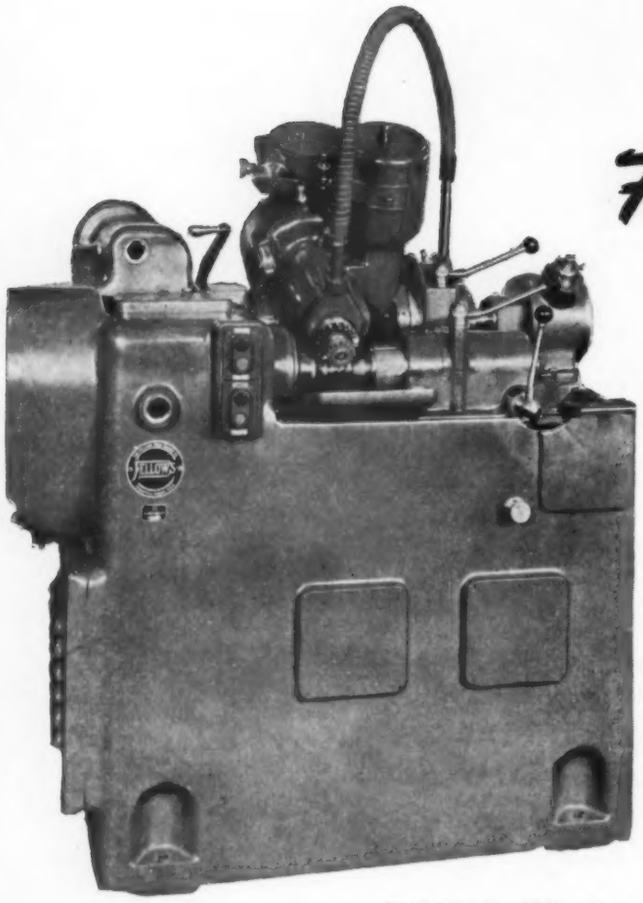
*9 cents



JONES & LAMSON
MACHINE COMPANY
SPRINGFIELD, VERMONT, U. S. A.

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

2 steps to make an



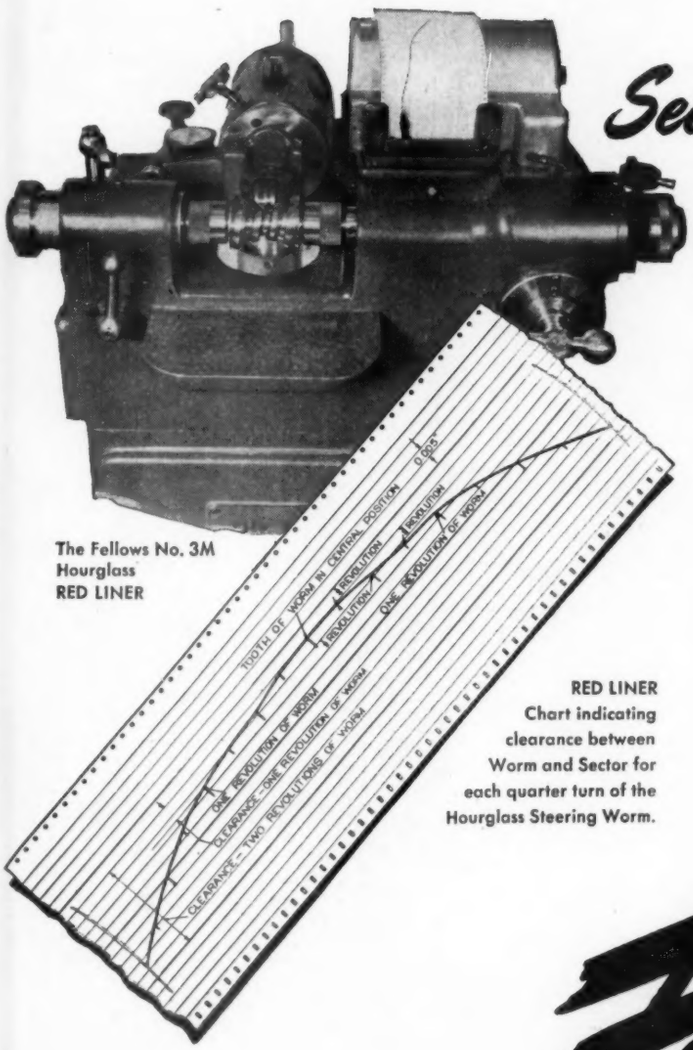
The Fellows No. 6T Hourglass Thread Generator

First: . . . generate it on the Fellows No. 6T Hourglass Thread Generator — the *special purpose* machine engineered by Fellows for the high-accuracy production of automotive hourglass steering worms. The Fellows Cutter used is fed directly into the work, rotates in harmony with it, and the depth feed cam has a "dwell" at the end of the cut to produce a smooth finish on the threads. A depression in this cam allows the cutter head to rise automatically at the completion of the cut, for rapid removal and insertion of the work.

THE FELLOWS METHOD . . . MACHINES AND TOOLS FOR

HOURGLASS STEERING WORM

turn *smoothly*


TOOTH OF WORM IN CENTRAL POSITION
0 DEG
1 REVOLUTION
1 REVOLUTION
ONE REVOLUTION OF WORM
ONE REVOLUTION OF WORM
CLEARANCE - ONE REVOLUTION OF WORM
CLEARANCE - TWO REVOLUTIONS OF WORM

The Fellows No. 3M Hourglass RED LINER

RED LINER Chart indicating clearance between Worm and Sector for each quarter turn of the Hourglass Steering Worm.

Second:

. . . check it on the Fellows No. 3M Hourglass RED LINER — the inspection instrument developed by Fellows solely for the checking of hourglass steering worms, and incorporating the same basic principles as the regular RED LINER. It records all errors in combination, and provides for checking various segment and roller and hourglass worm combinations.

If you are not already aware of this efficient, low-cost method of producing hourglass steering worms, consult the Fellows Sales Engineer, or write direct for descriptive literature. The Fellows Gear Shaper Company, Springfield, Vt., or 616 Fisher Bldg., Detroit, or 640 West Town Office Bldg., Chicago.

Fellows

ALL OPERATIONS FROM BLANK TO FINISHED GEAR

Announcement

TWO ADDITIONAL SIZES HAVE BEEN

● These machines have many outstanding and exclusive advantages which give them distinctive qualifications for grinding precision cylindrical work. They fill the need existing in many shops for centertype grinders capable of rapidly producing exceptionally fine finishes and close tolerances of accuracy in a routine manner and on any production basis. Because of their easy and quick manipulation features, and the wide selection of attachments which are available, they may be used for toolroom lots or high production work, for traverse grinding and infeed grinding. ¶ If you would like to know more about the features of these new machines, write for descriptive literature as indicated under the illustrations on the opposite page.

CINCINNATI

CENTER TYPE GRINDING MACHINES

CINCINNATI

10" L MACHINE

CINCINNATI FILMATIC 10"-L Plain Hydraulic Grinding Machine. Write for publication No. G-537 which contains complete information.

OF FILMATIC PLAIN HYDRAULIC GRINDING MACHINES ADDED TO THE CINCINNATI LINE

14" L MACHINE

CINCINNATI FILMATIC 14"-L Plain Hydraulic Grinding Machine. Complete details may be obtained by writing for publication No. G-533.

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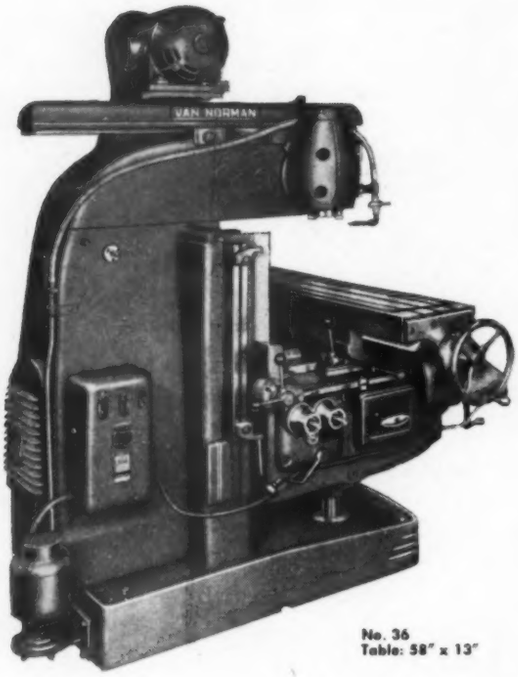
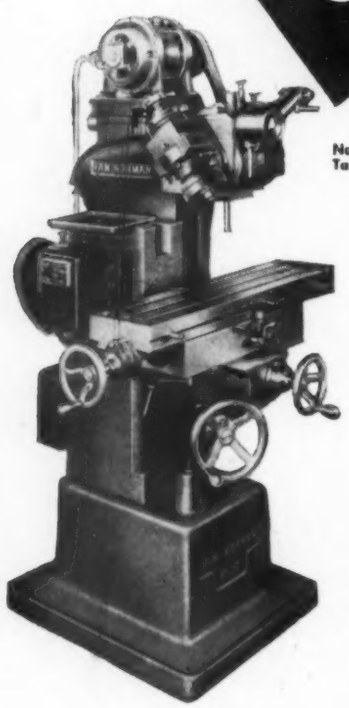


No. 36
Table: 58" x 13"

No. 22L
Table: 45" x 10"

Only Van Norman Ram Type



No. 12
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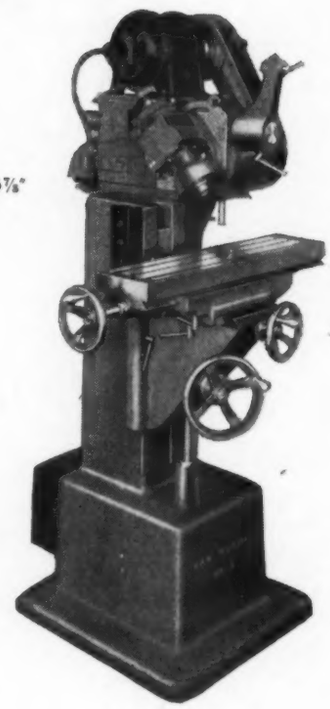


No. 6
Table: 30" x 6⅞"

Milling Machines give you

★ HORIZONTAL

★ VERTICAL

★ AND ANGULAR

MILLING

The big advantage of Van Norman Ram-Type Millers is their versatility. With these machines you can perform any kind of milling from horizontal to vertical simply by positioning the adjustable cutterhead. The result is increased machine production through elimination of idle operator and machine time. In addition, the adjustable cutterhead permits the operator to carry most jobs through to completion without changing the work setup . . . insuring accuracy and reducing rejects.

Here's a typical example of how Van Norman Ram-Type Millers fit into your general purpose and tool room picture. You have three ram-type millers. — Today the work schedule calls for two horizontal millers, one vertical. The operators simply position the cutterheads of two machines to horizontal and one to vertical and go ahead with the work. No waiting for specific machines . . . no loss in profits. Horizontal, vertical or angular, period to period, each Van Norman Ram-Type Miller can do the work.

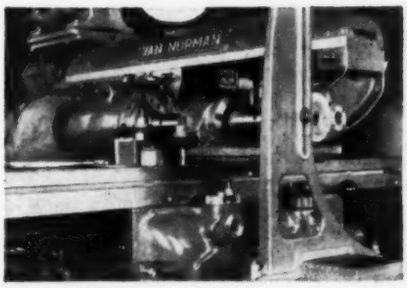
Added to versatility, Van Norman gives you front and rear controls, exclusive single lever feed selector, movable ram, dovetail ram ways, plus other advantages which speed milling operations, save money and assure accurate work.

Investigate Van Norman Ram-Type Millers. They are available with plain or swiveling tables for every type of work. *Each machine will not only meet today's requirements but will be ready for tomorrow's jobs as well.*

VAN NORMAN COMPANY
SPRINGFIELD 7, MASSACHUSETTS

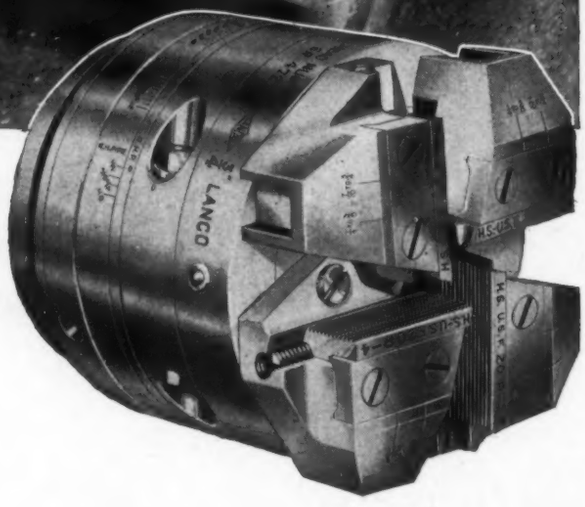
"It pays to Van Normanize"

The Ram-Type Miller used with the adjustable cutterhead in the vertical milling position and the operator using the front directional controls.



The Van Norman Ram-Type Miller with the head locked in the horizontal position for boring and facing.

With the cutterhead locked in an angular position, the operator is taking an angular cut on the workpiece, operating the Miller with the rear directional controls.



The precisely built ultra-modern LANDMACO Threading Machine producing continuous thread studs to close tolerances.

Continuous Threaded Studs Produced at Low Cost

With **LANDMACO THREADING MACHINE**

The Landmaco Threading Machine assures low production cost and the close thread tolerances on the continuous thread stud bolts used extensively in valves and high pressure piping.

The full length bars are first threaded with the Landmaco Machine, after which the studs are cut to length. The threads are cut to class 3 specifications and even though the material is tough alloy steel, 6 to 8 full length bars are threaded per grind of the chasers assuring low threading cost.

Write for Bulletin H-75, descriptive of the Landmaco Threading Machine. Investigate its advantages in handling your threading operations.

LANDIS MACHINE COMPANY

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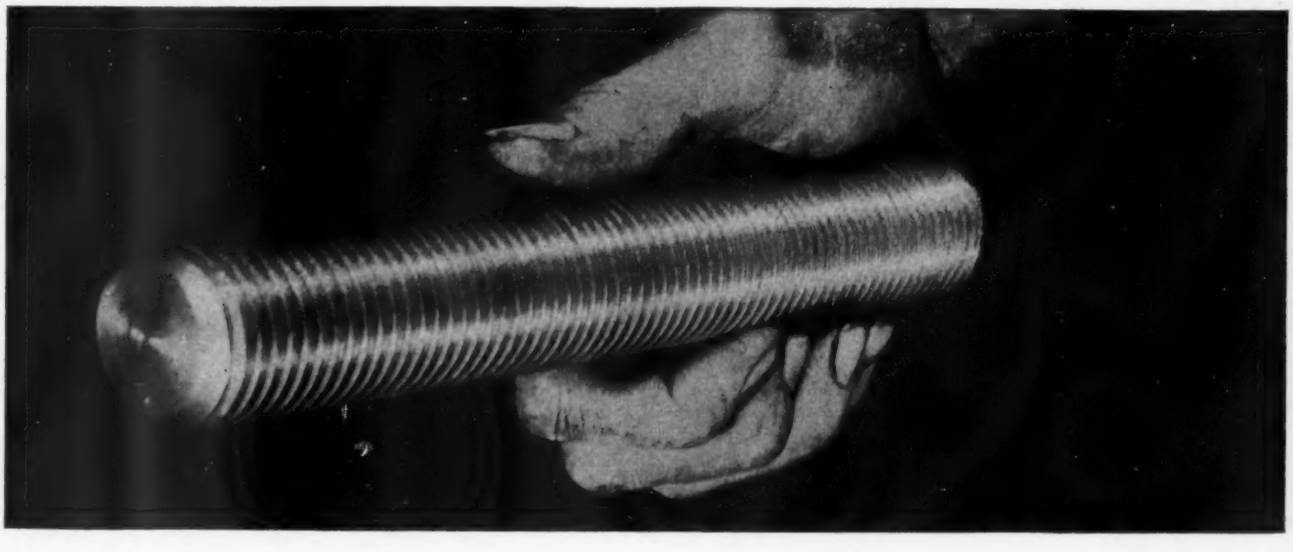

Yes Sir - we SAVED 10 HOURS on this job!

9 surfaces milled simultaneously and held to accurate distances.

Straddle milling job on Kempsmith Type G Milling Machine.

"Instead of knocking down the cutter and arbor set-up for this straddle-milling job, we did the sensible thing—we kept the complete set-up intact, ready for the next production run. The initial set-up required 10 hours . . . so we'll again be saving that much time on the next lot."

Today, especially, it's vitally important to conserve production time. It takes many hours to reconstruct multiple cutter assemblies. Save this valuable time by laying aside the complete set-up for the next run. Have an extra supply of arbors on hand for this purpose. Remember, arbors are "perishable" tools and their cost today is relatively small. That's why —

It always pays to SAVE THE SET-UP!

Kempsmith Arbors are available in all popular sizes and types, adaptable to any make of milling machine with standardized spindle. Mail coupon for literature.

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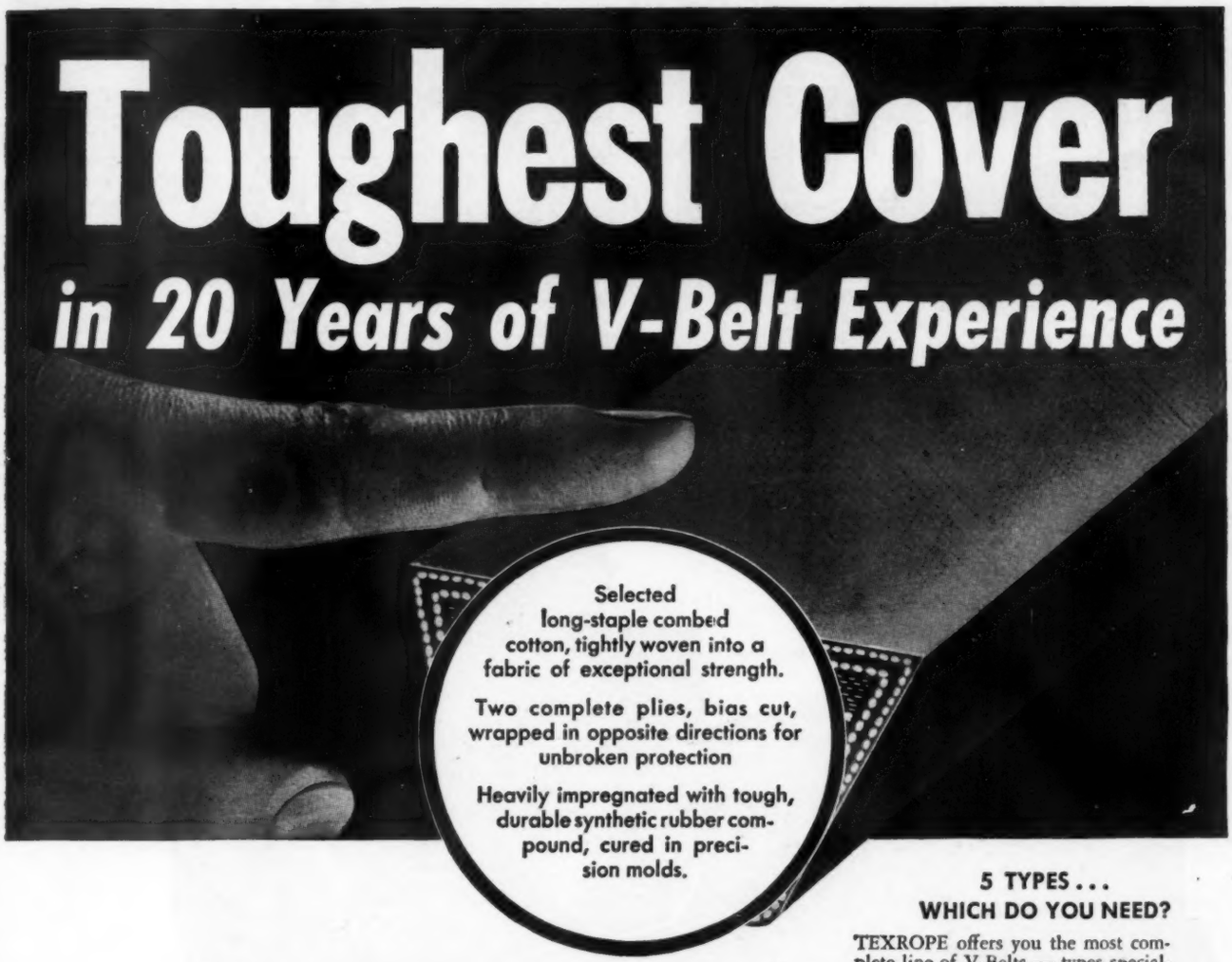
in 20 Years of V-Belt Experience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Heavily impregnated with tough, durable synthetic rubber compound, cured in precision molds.

Allis-Chalmers Builds Longer Life Into Famous TEXROPE V-Belts

A V-Belt is no better than its COVER. And . . . TEXROPE Super-7 belts today carry the toughest, most wear-resistant cover that Allis-Chalmers has developed since they invented the Multiple V-Belt Drive! It's the result of 20 years of continuous research and improvement.

This tough, resilient sheath is unbroken and unweakened by grooves or serrations. It takes the wear, holds the belt in shape, protects the load-carrying core structure.

Added Strength — Smoother, Cooler Running

50% Stronger Cords, impregnated with friction-fighting gum rubber. *War-proved Buna-S,* better, cooler-running than natural rubber. *Perfect Balance,* every belt accurately proportioned, precision molded to run true and cool. Make Allis-Chalmers your V-Belt headquarters! ALLIS-CHALMERS, Milwaukee 1, Wisconsin.

A 2003

5 TYPES . . . WHICH DO YOU NEED?

TEXROPE offers you the most complete line of V-Belts — types specially developed to meet ALL operating conditions. Pick the right TEXROPE Super-7 V-Belt — it'll give you the most in efficient power transmission.

Heat-Resisting Super-7
Stands temperatures up to 180°. The TEXROPE V-Belt for most drives.

Oil-Resisting Super-7
Neoprene cover protects core against moderately oily or greasy conditions.

Oil-Proof Super-7
Made of Neoprene throughout. Use it when the belt must swim in oil.

Static-Resisting Super-7
Recommended where explosion hazard exists. Static-conducting element throughout cover won't wear off.

Super-7 Steel
Twin steel cables, to pull extremely heavy loads with minimum stretch.

GET THEM — through your Allis-Chalmers district office or dealer.

TEXROPE Super-7 V-Belts result from the cooperative research of two great companies—Allis-Chalmers and B. F. Goodrich — and are sold exclusively by A-C.

V-BELTS
TEXROPE complete line — Sizes, types for every power transmission problem and condition.

ALLIS CHALMERS
TEXROPE V-BELT DRIVES
ORIGINATORS OF THE MULTIPLE V-BELT DRIVE

SHEAVES
"MAGIC-GRIP" . . . TEX-STEEL . . . TEXDRIVE . . . Speed changers and VARI-PITCH sheaves.

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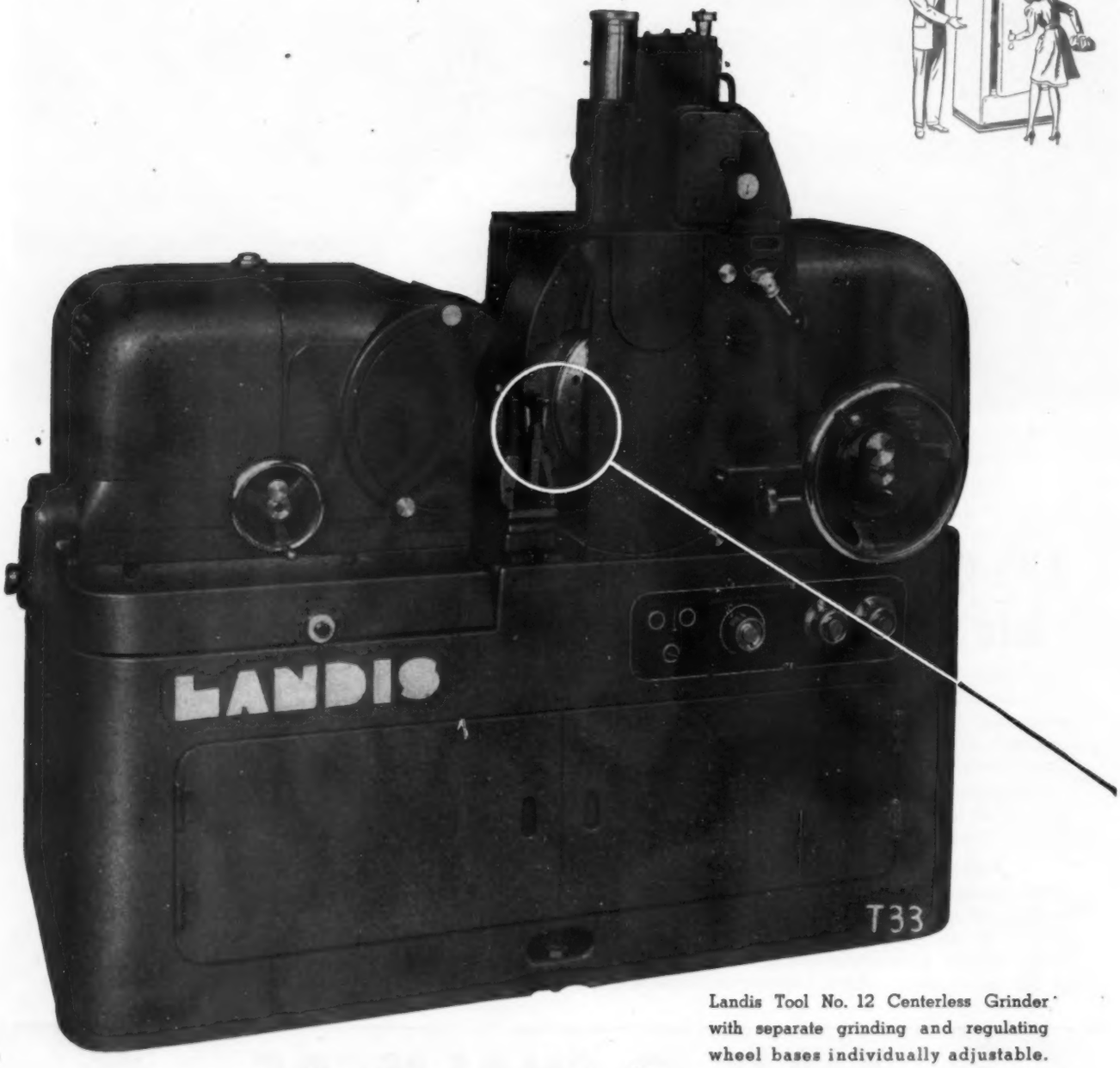
360 CRANKSHAFTS



Landis Tool No. 12 Centerless Grinder with separate grinding and regulating wheel bases individually adjustable.

LANDIS TOOL

Precision Grinders

LANDIS TOOL COMPANY

PER HOUR with Centerless Infeed Grinding

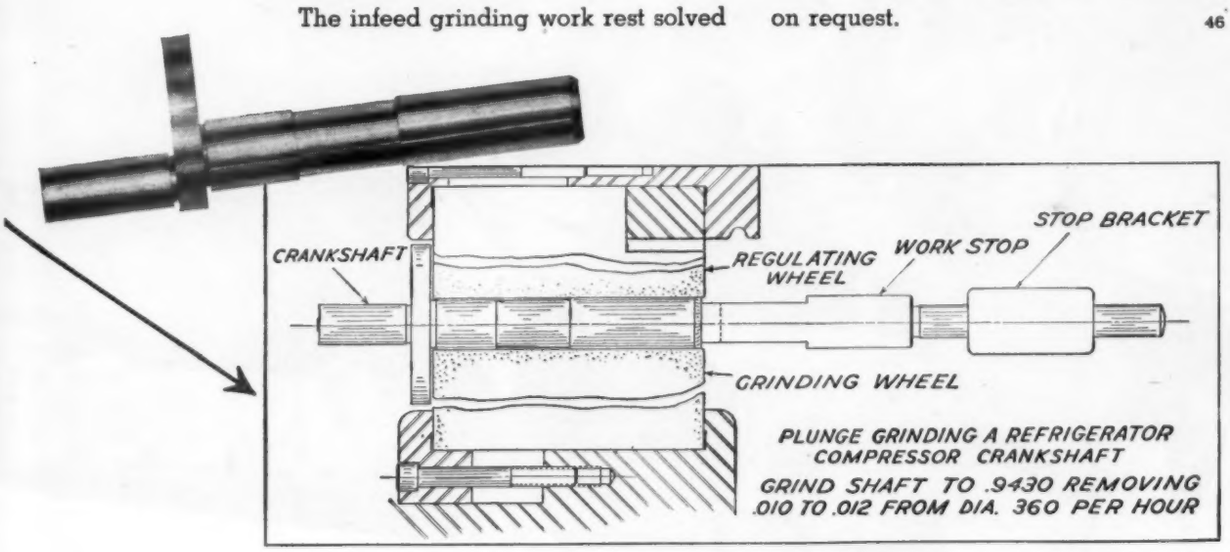
Infeed Grinding Work Rest Brings Centerless High Production To Shoulder Grinding

A refrigerator manufacturer had a problem of cost reduction and increased output of compressor parts. Sales inducements like five year guarantees and sealed units made it imperative that quality be maintained or improved.

When the job was turned over to Landis Tool grinding engineers they recognized that the high production requirements and fine finish called for centerless grinding.

The infeed grinding work rest solved the crankshaft grinding problem and with its adjustable feature made possible infeed grinding of the refrigerator compressor piston also. Production of both by infeed grinding was at the rate of 360 units per hour—a substantial production increase that lowered costs.

For help with your grinding problems, call on Landis Tool for Engineered Grinding Service. Catalog T-44 gives full information on the Centerless—available on request. 46


CRANKSHAFT
REGULATING WHEEL
WORK STOP
STOP BRACKET
GRINDING WHEEL
PLUNGE GRINDING A REFRIGERATOR COMPRESSOR CRANKSHAFT
GRIND SHAFT TO .9430 REMOVING .010 TO .012 FROM DIA. 360 PER HOUR

LANDIS TOOL Company

WAYNESBORO, PENNA.

TEAMWORK

THE AMERICAN TOOL WORKS C

K FOR PROFIT

Courtesy of Fairbanks, Morse & Co.

Quality Tools produce a Quality Product . . .

Fairbanks, Morse & Co., one of the world's leading manufacturers of Electrical Equipment and Diesel Engines, uses scores of "American" Hole Wizard Radial Drills to produce quality at a profit.

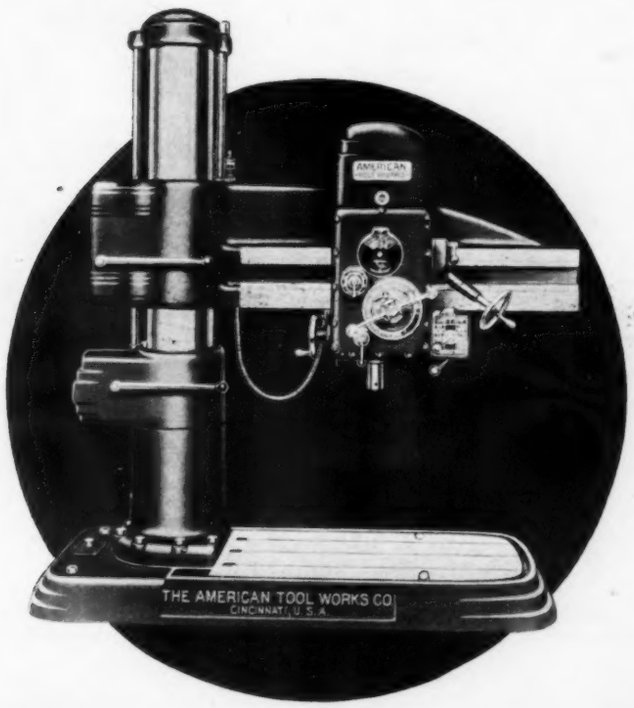
The smooth operation and easy handling of "American" Radials give them front rank recognition amongst users as dependable producers of accurate and finely finished work.

The directly connected, head mounted motor guarantees maximum power at the spindle.

Finger-tip and direct-reading controls insure speedy manipulation for greater work production.

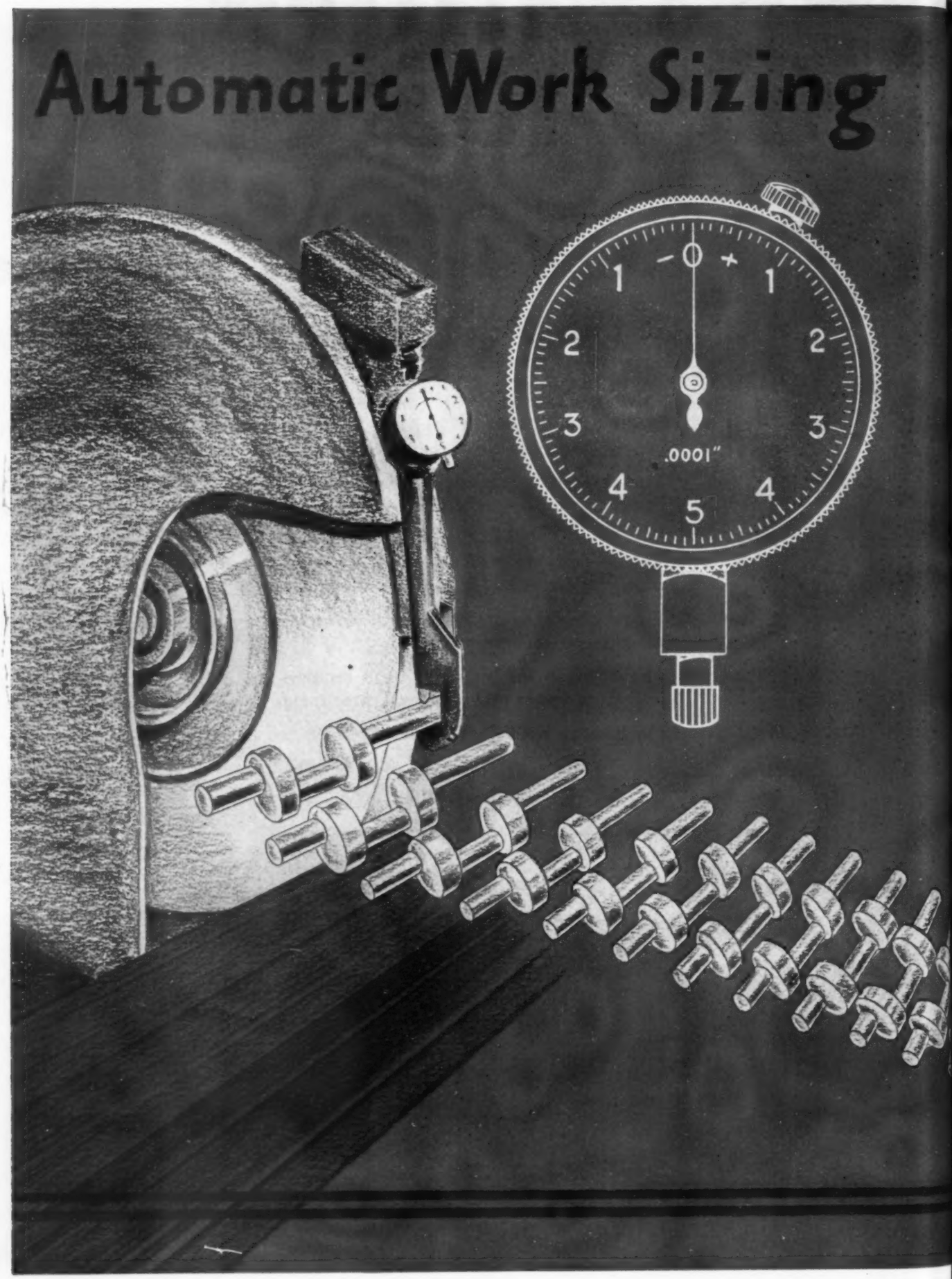
Anti-friction mounting of head on arm and convenient location of all operating levers mean less operator fatigue and more work at day's end.

For quality work at a profit your best bet is "AMERICAN".



Lathes and Radial Drills **Cincinnati, Ohio U.S.A.**

Automatic Work Sizing



to .0001" with no variation . . . the Solution to HIGH PRECISION PRODUCTION

THE NORTON AUTOMATIC WORK SIZING DEVICE
offers these outstanding advantages:

Holds fine limits within .0001" — no variation

Unusual accuracy and dependability

Quantities of parts within fine limits at less cost

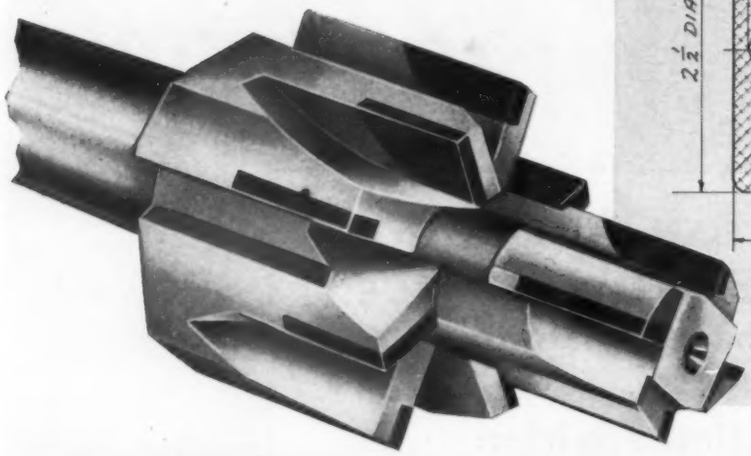
Improved quality control

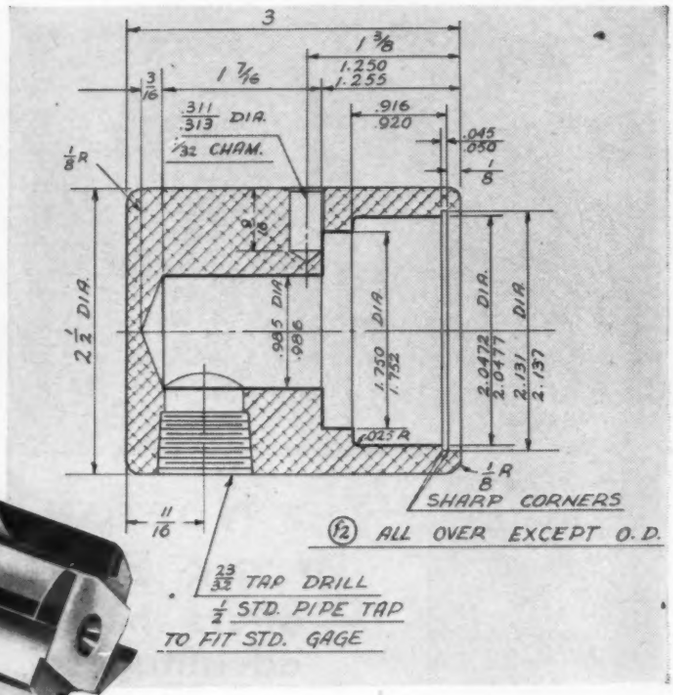
NORTON COMPANY, WORCESTER, MASS.
Distributors in all Principal Cities

M 517

NORTON GRINDERS *and Lappers*

Three-diameter Staples Carboloy-tipped Combination Reamer, specially designed to meet the requirements of this close tolerance operation.





Staples CARBOLOY-TIPPED CEMENTED CARBIDES SPECIAL TOOLS

SPEED THE JOB TO FINER PRECISION

Ream two or more diameters simultaneously with a Staples Carboloy-tipped Special Tool, and you save important time and costs. But, more important—you achieve an exceptional all-over precision and closer tolerances.

Staples superiority is the result of diamond lapping of Carboloy Cemented Carbide tips, copper brazed to steel for braze strength, and the fine grinding of flutes for free passage of chips. Uniform excellence of diamond ground cutting surfaces means many more pieces before regrinding.

Any job that justifies a special tool is entitled to no less than Staples Tool precision.

Staples Special Tools and the line of Staples Standard Tools are widely used in American Industry . . . where stepped-up reconversion activities call for faster operations and the highest quality.

THE STAPLES TOOL COMPANY

Formerly Staples Tool & Engineering Company

CINCINNATI 25 **OHIO**

WHATEVER YOUR MACHINING PROBLEM

— however complex — Staples Special Tool engineering facilities will help you solve it.

Staples CARBOLOY-TIPPED CIRCULAR CUTTING TOOLS

REAMERS • CORE DRILLS • SPOT FACERS • COUNTERBORES • END MILLS • SHELL END MILLS • ALSO A COMPLETE LINE OF CIRCULAR SPECIAL TOOLS

ONE FINGER is all it takes

to start, stop, or reverse the spindle

. . . and this is a 50 h. p. headstock!

Yes, it's as easy as this with Gisholt's new Hydraulic Spindle Control. Just touch this handy lever...hydraulic power engages and disengages the forward and reverse multiple disc clutches. When the control lever is in neutral, pressure is directed to a contracting band-type brake which brings the spindle to a quick, smooth stop. Thus, headstock control is effortless—as easy as pushing buttons!

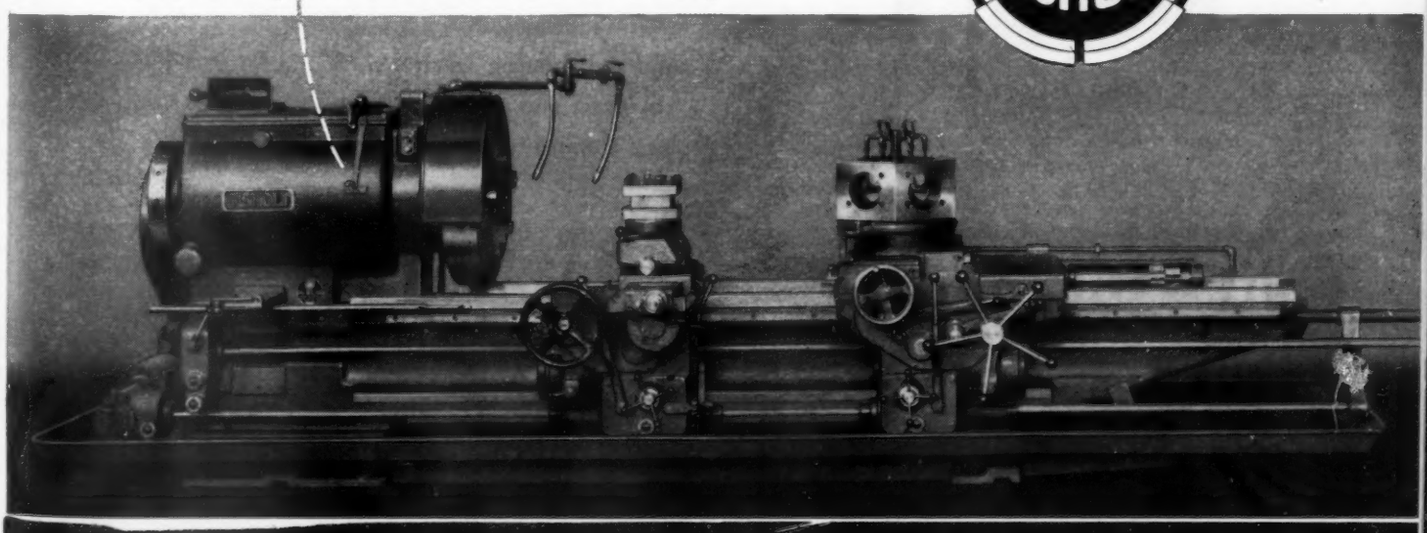
The Gisholt 5L Saddle Type Turret Lathe shown below is an extremely powerful machine with a 50 h.p. headstock. Yet it requires surprisingly light operating effort. Another outstanding example of Gisholt leadership in faster, lower cost machining, the Gisholt hydraulic spindle control is now available *on all* Gisholt Turret Lathes. Write for complete information.

Look Ahead . . . Keep Ahead . . . with Gisholt Improvements in Metal Turning

GISHOLT MACHINE COMPANY

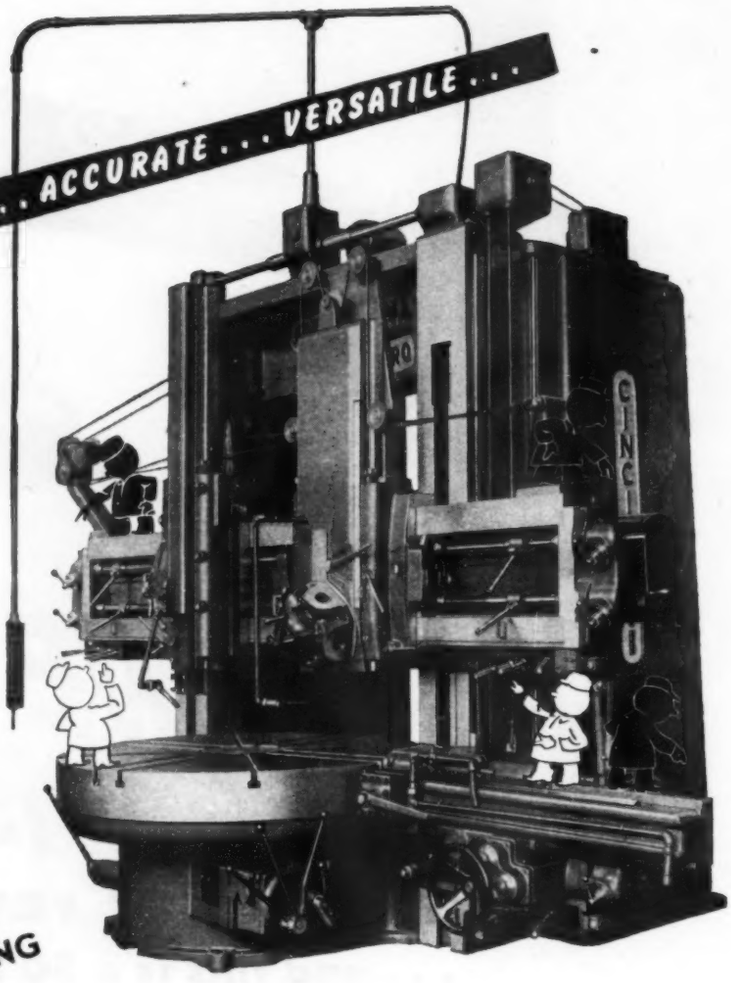
1201 East Washington Avenue • Madison 3, Wisconsin

GISHOLT



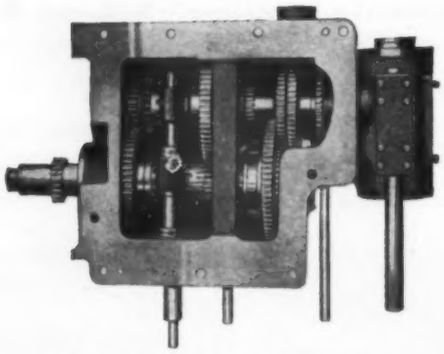
TURRET LATHES — AUTOMATIC LATHES — SUPERFINISHERS — BALANCERS — SPECIAL MACHINES

IT'S FAST . . . ACCURATE . . . VERSATILE . . .



The NEW and IMPROVED CINCINNATI HYPRO Boring Mill

FEATURING INDEPENDENT FEED, RAPID TRAVERSE AND REVERSING MECHANISM FOR EACH HEAD



Hypro Anti-Friction Power Feed and Traverse Box

An individual unit is provided for each Head and contains the complete power feed, rapid traverse, reversing mechanism and safety clutches.

All levers for feed, traverse and reverse are placed in front of the machine convenient to operator's working position.

Each box contains hardened alloy steel gearing mounted on multiple splined shafts and anti-friction bearings. Complete unit is enclosed and runs in a bath of oil supplied by a pump incorporated in the box.

THE CINCINNATI HYPRO PLANER COMPANY

PLANERS · BORING MILLS · PLANER TYPE MILLERS

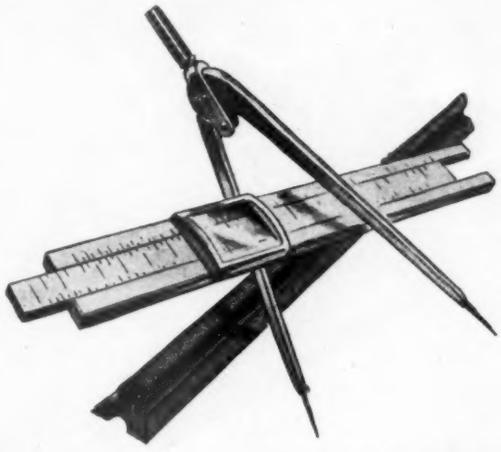
CINCINNATI, OHIO

Ever Figure What a 765 hp Motor Throws Off in Heat?

Our Navy Did . . . on fleet tugs down in the tropics, where engine room temperatures were running high as 140°F! In 25 by 30 ft of space, that's like having 140, thousand-watt radiant heaters "raising blisters" on you all at one time!

Here's How Navy Figured: To get 765 shaft hp out of 94% efficient propulsion motors, of which there are four aboard, they were putting in about 812 hp of electrical energy. Or, 47 hp went in that didn't come out of the shaft, but escaped through the frame. This ran about 35 kw heat per motor.

Well, Our Temperatures Began To Rise when Navy laid down its 'specs'. "Design a marine water-cooled motor—make it fit into the floor space of your open drip-proof type—no major changes in ship design. Make it extra-dependable, as fireproof as practicable".



We Measured, and figured, and made designs—used a new, toxic gas-free Glass Melamine insulation that required extensive changes in design and fabrication. We put special air passages inside the motor—yet kept accessibility. We saved 25% space over our previous commercial marine design by figuring a special shape cooler—without cutting down cooler efficiency.

Then We Made Those Motors Shock-Proof — by cutting out all cast iron, re-designing structural members for greater strength, resorting to modern, proven fabrication throughout. Result: A new kind of water-cooled motor that put a "tough" Navy job on ice, and also proved a point! A 1999

There's a Point to this story: Every time Allis-Chalmers engineering discovers new ways of solving *special* motor problems, like this one, it also learns how to build better *standard* motors for you! Watch for these new and better motors from A-C. ALLIS-CHALMERS, MILWAUKEE 1, WIS.

Wait 'til you see the NEW

ALLIS-CHALMERS MOTORS!

HEAR THE BOSTON SYMPHONY: *Every Saturday Evening, American Broadcasting Co.*

NO MATTER WHAT YOUR
EX-CELLO'S COMPLETE PARTS
PRODUCTION FACILITIES MAY
BE OF PRACTICAL HELP TO
YOU!

PRODUCT MAY BE

XLO

EX-CELL-O *for* PRECISION

Facilities and Services for Miscellaneous Production Parts

PRODUCTION ENGINEERING

The Ex-Cell-O organization, with skill, facilities and modern methods that have made a wartime record, can make an important contribution in the planning of quantity production of quality parts and unit assemblies for your postwar product.

PRODUCTION MACHINES

Multiple Vertical Turret Lathes • Multiple Spindle Automatic Screw Machines • Single Spindle Automatic Screw Machines • Hand Screw Machines • Engine Lathes • Centerless O.D. Grinders • Centerless I.D. Grinders • Single and Multiple Spindle Drilling Equipment • Form Grinding Machines • Plain O.D. Grinders • Plain I.D. Grinders • Surface Grinders (Plain and Rotary) • Milling Machines • Thread Milling Machines • Broaching Machines (Vertical and Horizontal) • Precision Thread Grinders • Thread Rolling Machines • Precision Boring Machines • Lapping Machines • Special High Production Equipment

HEAT TREAT

Laboratory for Heat Treat Control Including Micro Examination and Photography • Induction Heat Treating • Sub-Zero Heat Treating Equipment • Atmosphere Control Continuous Hardening Furnaces • Atmosphere Control Box Hardening Furnaces • Various Types of Air-Draw Batch Type Furnaces • Pack Carburize Furnaces • Gas Carburize Furnaces • Vertical High Speed Steel Atmosphere Control Hardening Furnaces • Nitriding Furnaces • Cyanide, Lead, and Neutral Salt Pot Furnaces • Continuous Air-Draw Furnaces

UNIT ASSEMBLIES

For many years Ex-Cell-O has supplied large and small manufacturers with parts and has also supplied many parts in unit assemblies after machining, heat treating and grinding.

INSPECTION

Ex-Cell-O has always maintained that quality in a product is not the result of accident; that quality is built into a product by rigid adherence to accepted quality standards . . . standards that are upheld at Ex-Cell-O by efficient inspection at every step of the machining process, and that give real economy.

Few people realize how extensive are Ex-Cell-O's facilities for the speedy production of quality parts. Yet the same wide experience, the engineering "know-how", and the outstanding accuracy that distinguish Ex-Cell-O machine tools and cutting tools wherever they are used . . . in many parts of the world . . . go into Ex-Cell-O's production parts manufacture.

If your product requires carefully machined parts, the chances are Ex-Cell-O can work with you to your economical advantage. Contact Ex-Cell-O today, either at the Head Office in Detroit or through any one of the 27 other leading industrial centers where Ex-Cell-O field engineering representatives are located.

EX-CELL-O CORPORATION • DETROIT 6

Folder illustrating Ex-Cell-O's complete parts production facilities will be sent you upon request. Write or wire Ex-Cell-O today and ask for Ex-Cell-O Bulletin No. 36151

A Life Saver for this

Thousands of small contract shops were of immeasurable help in our country's wartime need . . . now these small businesses, along with big business, face reconversion problems.

The Ward Machine & Tool Co., Alden, New York, employing only seven men, was a busy little shop throughout the war. With the addition of a Warner & Swasey No. 3 Universal to the shop's engine and bench lathes, it produced miscellaneous parts and service tools for airplane manufacturers, tire companies, and mine sweeper parts for the Navy Department.

Terminations and cancellations came with devastating suddenness after V-J Day.

It was a case of getting other work quickly, or getting out of business. The Ward Company sought and obtained orders for peacetime parts —parts for farm machinery, floor surfacing machines, plastic molding machines and auto trailers...yes, even small parts for fishing tackle.

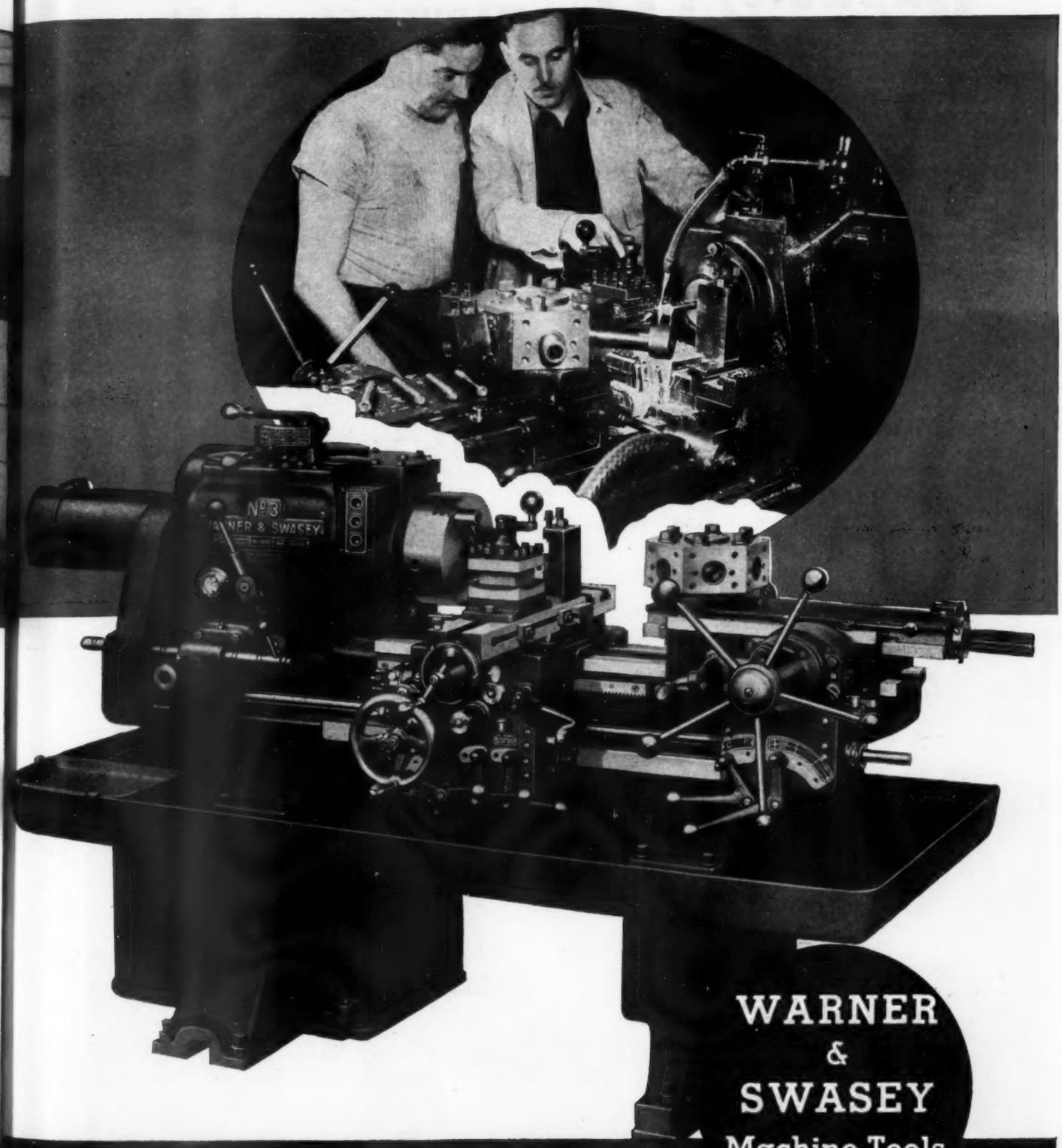
It wasn't possible to produce these peacetime jobs profitably on the old equipment. The adaptability, speed and accuracy of the Warner & Swasey No. 3 Universal proved to be a veritable business life saver. It could handle the diversified new work, permit economical prices to customers and show profits.

This small shop gives full credit to this single turret lathe for enabling it to weather a serious reconversion upset.

The Ward Company, typifying the ingenuity and enterprise of small business in America, expects to *stay* in business and "go places."

TURRET LATHES, MULTIPLE SPINDLE AUTOMATICS, PRECISION TAPPING AND THREADING MACHINES

small machine shop



WARNER
&
SWASEY
Machine Tools
Cleveland

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS... WITH A WARNER & SWASEY

Capacity . . .

MARVEL 18 *for Size,* MARVEL 6A and 9A *for Volume Production*

With this battery of twelve No. 6A and No. 9A MARVEL High Speed Automatic Hack Saws, the Hammond & Irving Forge Co. of Albany, New York can cut-off billets automatically, not only in tremendous numbers, but in accurate weights and sizes to exactly fill each die without waste. With 12 of the "world's fastest cutting-off saws", they were able to keep all hammers running on their tremendous war orders, and were able to instantly resume peacetime manufacturing without re-tooling or other delay. The No. 6A and No. 9A MARVEL automatics have capacities of 6" x 6" and 10" x 10" respectively.

In addition to the battery of MARVEL Automatics, Hammond & Irving have cutting-off *capacity* of a different sort in their MARVEL No. 18 Hydraulic Hack Saw—capacity for size because their stroke giant will cut-off the largest billets and bars. It easily handles the toughest steels in sizes to 18" x 18" cross section.

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 BLOOMINGDALE AVENUE CHICAGO 39, U. S. A.

Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

You Pay for NOTHING EXTRA "KNOW-HOW"

Continental's Years of Experience in Design and Manufacture of Cutting Tools Make a Big Difference

Accuracy is of first importance in cutting tools. By the very nature of the job it has to do, a precision cutting tool must be even more accurate than the machine, the fixture, or the part being finished. For 26 years The Continental Tool Works (a division of Ex-Cell-O Corporation) has been designing and manufacturing cutting tools which meet these exacting requirements. This long experience is your assurance that when you specify "Continental," you get cutting tools of quality which will do your job right!

Continental Engineering Department (upper photo) designs tools to customers' specifications. Lower illustration shows a few precision grinding machines used in finishing Continental Cutting Tools to close tolerances.

See the Continental Tool Works Exhibit at the A.S.T.E. New Era Exposition Cleveland, April 8-12. Booth 1437.

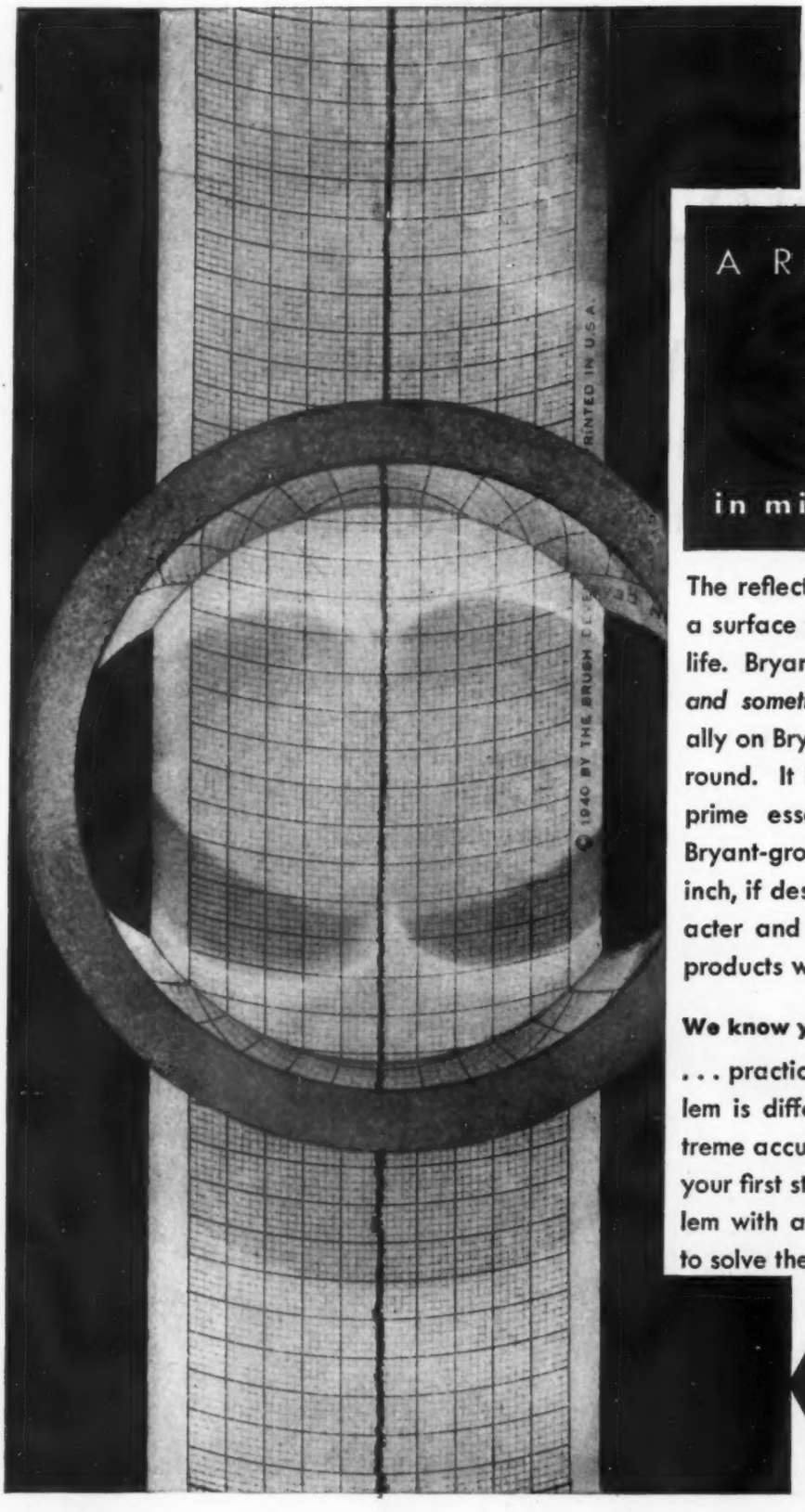
CONTINENTAL TOOL WORKS
DIVISION OF EX-CELL-O CORPORATION
DETROIT 6, MICHIGAN

46—24

Continental
CUTTING TOOLS

- Boring Bars and Tools
- Broaches Broach Pullers Broaching Fixtures
- Core Drills
- Counterbores and Countersinks
- CTW Drive Holders
- Counterbores (Tool Room Sets)
- Counterbore Pilots
- Inserted Blade Cutters
- Carbide Tipped Cutters
- Form Relieved Cutters
- Milling Cutters
- Thread Milling Cutters
- End Mills
- Side Mills
- High Speed Steel Reamers
- Carbide Tipped Reamers
- Shell Reamers
- Inverted Spotfacers
- High Speed Steel Tool Bits
- Carbide Tipped Tool Bits
- Circular Form Tools
- Cut-off Tools
- Flat Form Tools
- Dovetail Form Tools

CTW



A REFLECTION OF

in millionths of an inch

The reflection in the bushing, at left, shows a surface finish which assures long bearing life. Bryant Grinders assure fine work finish *and something more*—work ground internally on Bryant Grinders is also straight and round. It is the combination of these three prime essentials that gives character to Bryant-ground parts—in millionths of an inch, if desired. These essentials give character and long life to the assemblies and products which you manufacture.

We know your problem is different

. . . practically every internal grinding problem is different, but when you require extreme accuracy or high production, *or both,* your first step should be to study your problem with a man who makes it his business to solve them. Your first step should be to—

Send for the Man from Bryant!

This bushing, with hole ground in a Bryant Grinder, was checked for surface accuracy. The chart line shows deviation. Distance between vertical lines represents one-millionth of an inch.

BRYANT

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

Continued

Grinding Questions Answered

By Allen Steele, Manager, Dayton Grinding Wheel Division
SIMONDS WORDEN WHITE COMPANY

This series of questions and answers is presented as a practical aid in the solution of many of the more common grinding problems. Readers are invited to send in their own grinding questions, without obligation of any sort. All questions will be answered by mail or in this column. No identities will be revealed if published.

71 Q. *"Here is a problem that has yet to be solved. We have a cylindrical grinding operation where a high finish is required. Most of the work comes through fine, but occasionally there is a piece with light scratches. We use a filter tank and attempt to keep it clean, but still the scratches occur."*

A. Since you keep your filter tank clean, the trouble you complain of may be due to the use of a "too fatty" grinding fluid which holds the chips in suspension too long. Or, it could be due to the accumulation of foreign matter on the inside of the wheel guard. Such an accumulation, when permitted to remain, will occasionally break-off, fall on the wheel, and is then carried around between the wheel and the work causing scratches. We suggest you investigate these two possible "trouble makers."

72 Q. *"What is the best method for dressing a large diameter wheel?"*

A. Because a large wheel is rotated at a relatively low R.P.M., the use of a diamond dressing tool sometimes leaves marks on the wheel which are transmitted to the work. For this reason, a mechanical dresser is generally advisable. Or, if a diamond is used, the traverse should be extremely slow.

73 Q. *"What is the general rule in regard to position of the work support blade in centerless grinding?"*

A. In centerless grinding the work is ground usually (but not always) with its centerline above the centerline of the wheels. To determine how far above, it is generally best to set the centerline of the work approximately one-half the work diameter above the centerline of the work. From that point, adjustments—if necessary—can be made up or down, as required.

74 Q. *"When centerless grinding material is badly warped following hardening, what is the best angle to set the regulating wheel?"*

A. To straighten work that is badly warped from hardening, the regulating wheel is generally set at an angle of 5 degrees or 5½ degrees.

75 Q. *"Is the type of coolant used very important when wet-grinding cemented carbide tools on a surfacing machine?"*

A. Opinions seem to differ in regard to the best coolant to use in the wet-grinding of cemented carbide tools on surfacing machines. Regardless of the type of coolant, the most important thing is to see that it literally floods the work in order to lessen the danger of over-heating.

76 Q. *"In gear tooth grinding, of hardened steel, how do you go about determining how much stock to leave on the piece before the grinding operation is started?"*

A. The amount of stock to be left before grinding depends on how accurately the pieces have been machined and the degree of distortion resulting from the heat treatment. Both of these factors deserve considerable attention since both can seriously affect the production rate of the grinding operation.

77 Q. *"What is the cause of work finishing up rather hollow in the middle in the throughfeed centerless grinding? Is it the guides?"*

A. Hollow shaped work in throughfeed centerless grinding is due to either the front guides or the rear guides being deflected towards the grinding wheel—or it can be caused by a concave face on the regulating wheel.

78 Q. *"We have a job grinding soft cold rolled steel shafts 3¼" in diameter. We are using a 30" aluminum oxide wheel which cuts satisfactorily but leaves sort of a pitted finish. What is the cause and remedy for this?"*

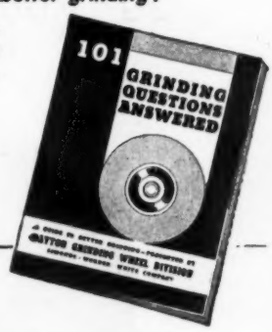
A. Probably some of the small metal chips cut from the material get lodged between the wheel grains. This suggests that the wheel is too soft and of too open structure, so a slightly harder and more dense wheel should eliminate such pitting.

79 Q. *"We have just started on a tubular grinding job. The wall of the tube is only 3/32" thick and is inclined to distort due to the heat the grinding generates. What will eliminate this distortion?"*

A. Try feeding the wheel in more slowly. Another way to eliminate such distortion is to fill the tube with water (where possible) and then plug it up at both ends. This will permit almost a normal rate of feed.

FIFTH EDITION READY NOW... a guide to better grinding!

101 "Answers" to everyday grinding problems—indexed for quick, easy reference—will be sent FREE to anyone interested in better grinding practices. Just fill in and mail coupon below.
SIMONDS WORDEN WHITE CO., DAYTON 7, OHIO.



DAYTON GRINDING WHEELS

COPYRIGHT 1946, SIMONDS WORDEN WHITE CO.

SIMONDS WORDEN WHITE CO.,
712 Negley Place, Dayton 7, Ohio

Please send me Free Booklet "101 Grinding Questions Answered"

Name_____

Firm_____

Address_____

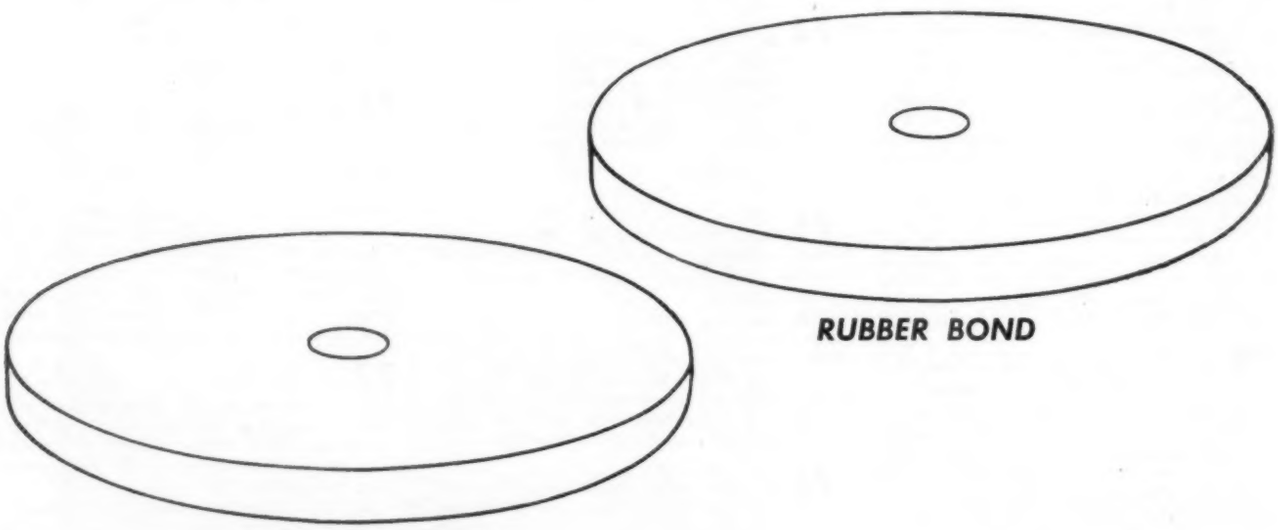
City_____ Zone_____ State_____

Who really knows

Your experience tells you this is a tough one to answer. You've seen what correct bond selection means in faster, better grinding at less cost. You know the importance of the right bond in terms of maximum cut with minimum pressure and lowest wheel loss.

You have probably seen one of your own shop experts worried with what seemed a logical choice. For, there's plenty of room for error in evaluating the many variable factors involved. For instance the speed of the grinder, tolerance limits, or production schedules are but a few of many factors to be considered. Yet, neglecting one...even partially...will upset the calculated performance of the wheel you choose.

To help you make the best choice of wheels, CARBORUNDUM has organized a system of checks and balances. It offers you a practical service...service easy to use...service depended on by many successful concerns.

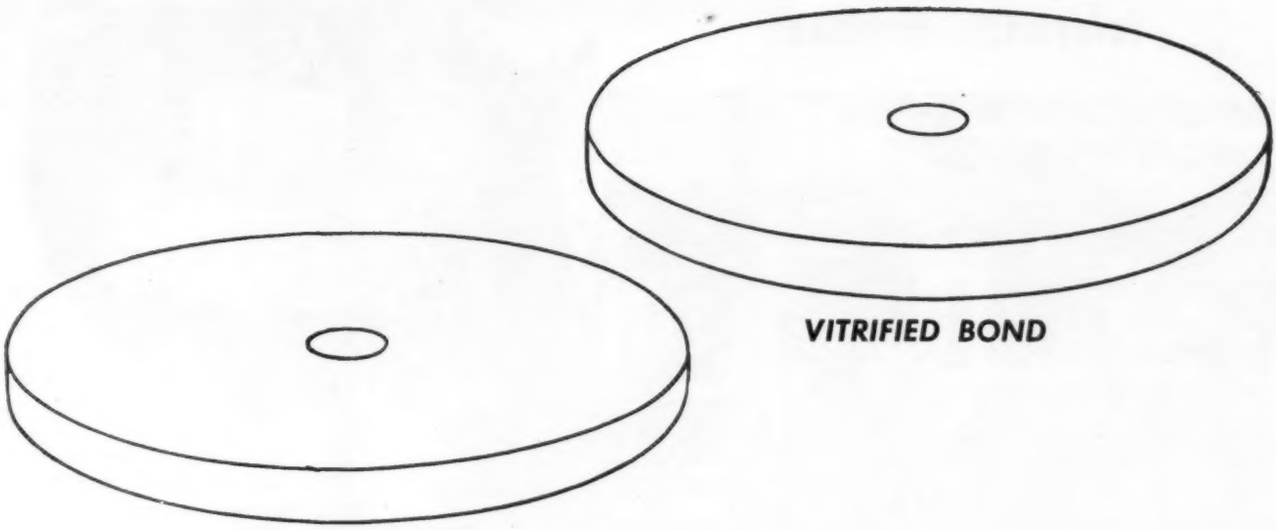


RUBBER BOND

SHELLAC BOND

A good rule for good grinding... **CALL**

what bond is best?



VITRIFIED BOND

RESINOID BOND

CARBORUNDUM salesmen and our distributor's representatives are your contact with this service. They are familiar with your needs. They are informed on latest abrasive developments. Supporting them in the field are our Abrasive Engineers...qualified to solve tough grinding problems. And here, in the modern laboratories of CARBORUNDUM, are scientists and technicians probing grinding practices in the light of abrasive development. As a result, they usually come up with the most direct solution to difficult grinding problems.

There is no better way to find out what bond is really best, or what wheel to use, than to depend on this organized service. It is a smooth working combination of knowledge and experience. Call in CARBORUNDUM. There is no surer means of making certain you are getting the best. The Carborundum Company, Niagara Falls, New York.

IN CARBORUNDUM

TRADE | MARK

BONDED ABRASIVES

WHEELS
Silicon Carbide
Aluminum Oxide
Diamond

Cylinder Hones
Sticks, Stones & Rubs
Specialties

COATED ABRASIVES

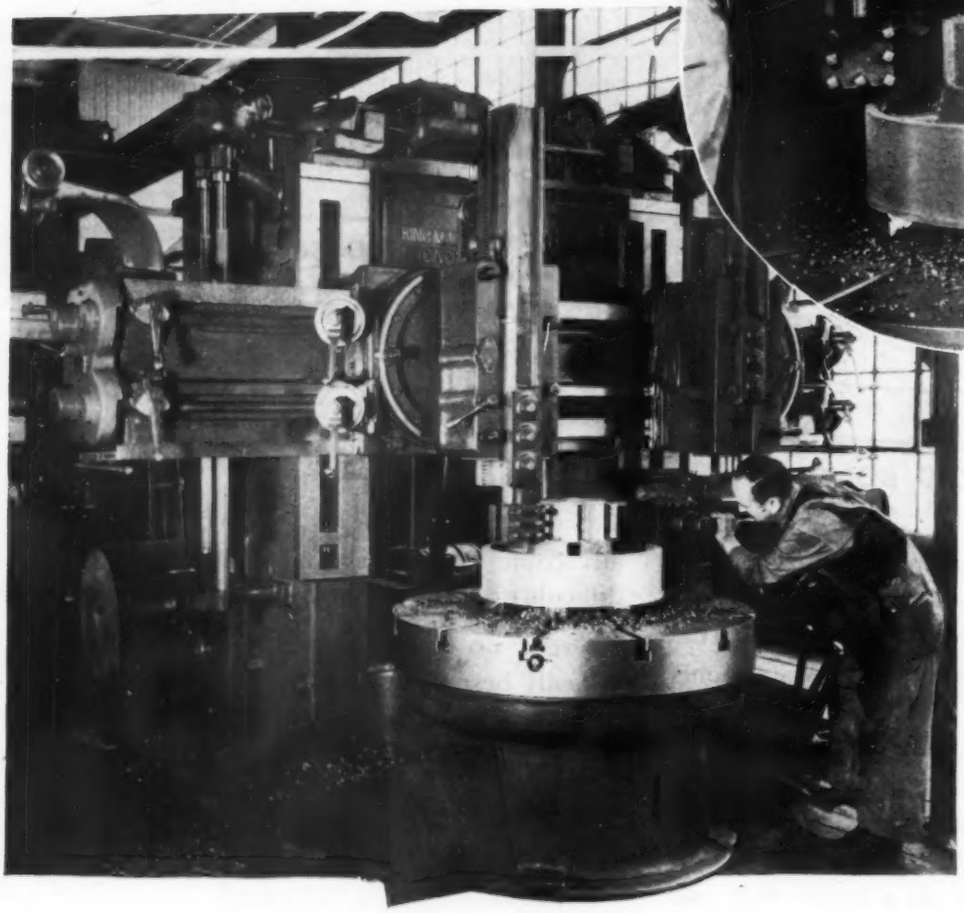
Paper, Cloth and Combination
Sheets, Rolls, Discs

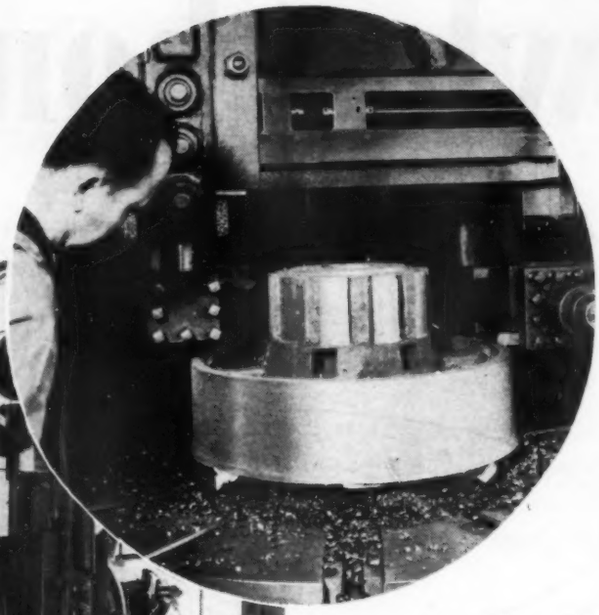
ABRASIVE GRAINS AND COMPOUNDS

for:
Polishing
Lapping
Pressure Blasting
Finishing

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company

KING *Power and Rigidity meets close tolerance demands*





Above—close-up showing side head and left-hand ram taking finishing cut simultaneously.

★

KING BUILDS

Vertical Boring and Turning Machines exclusively—single column types from 30" to 42" inclusive—double column types 52" up to 12 feet.

★

● King power and rigidity combine to meet the close tolerances and required finish on this special alloy nickel steel casting.

Here a 26½" diameter by 5" wide drum is being turned and a 7" diameter hole 12" deep is being bored. Two set-ups were required, first, rough bore inside diameter, rough and finish turn face—second, finish inside bore, finish outside diameter, rough and finish opposite face.

This is typical of the way King Vertical Boring and Turning Machines speed-up production and reduce costs on precision boring—turning—and facing operations.

THE KING MACHINE TOOL COMPANY
CINCINNATI 32, OHIO

BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY

The CONE AUTOMATIC MACHINE COMPANY sees many GOOD THINGS AHEAD

It is reported that . . . . . .

The National Advisory Committee for Aeronautics proposes to release to schools, libraries and industries over 300 technical reports hitherto secret.

get ready with CONE for tomorrow

Lycoming is experimenting with two new aircraft engines: a 36-cylinder, 5,500 lb. radial developing 5,000 h.p., and a 12-cylinder, 2,100 h.p., weighing only 1,445 lbs.

get ready with CONE for tomorrow

Monsanto Chemical Co. has a plastic armor plate that has shattered machine gun bullets in tests.

get ready with CONE for tomorrow

Curtiss-Wright is working on an "uninhabited" airplane capable of 1,400 miles per hour.

get ready with CONE for tomorrow

Firestone is making a heavy-duty tire with a wire carcass for off-the-road trucking.

get ready with CONE for tomorrow

A new distillery, the largest of its kind in the Western Hemisphere, will be built in Maine to make alcohol from Aroostook County potatoes.

get ready with CONE for tomorrow

Shell Oil Company has a new combustion head for gun-type domestic burners that will cut fuel consumption 20% and is suitable for use on burners now in operation.

get ready with CONE for tomorrow

Eastman Kodak promises that any reasonably well equipped amateur will soon be able to make his own color transparencies and prints.

get ready with CONE for tomorrow

Jack and Heintz will manufacture the Skinner gasoline engine. This is a double-opposed "pancake" type, made largely of aluminum with a compression ratio of 8 to 1 and a weight of less than 2 lbs. per h.p.

Mellon Institute has found, after thorough testing, that solid magnesium alloys do not burn.

get ready with CONE for tomorrow

The Weather Bureau has begun a survey of the country's wind resources in anticipation of the use of wind power for generating electricity.

get ready with CONE for tomorrow

A new kind of glass made by American Optical Company transmits 90% of visible light rays, but only 10% of heat rays.

get ready with CONE for tomorrow

Fifteen years of research have led to a form of porcelain enamel, made by C. Hommel Co. of Pittsburgh, that is so thin as to be practically chipless.

National Carbon Company has a new oil made with a secret non-petroleum base, called "Prestone Motor Oil" that shows very little change in viscosity from 30° below zero to operating temperature.

get ready with CONE for tomorrow

Illinois Central and Edison General Appliance Co. have collaborated on the first all-electric dining car, scheduled to go into service early in 1946. The car has its own diesel generating plant which supplies all facilities for cooking, freezing, dish washing, garbage disposal and air conditioning.

get ready with CONE for tomorrow

The Celotex Corporation has patented a process for making building planks out of excelsior and Portland cement.

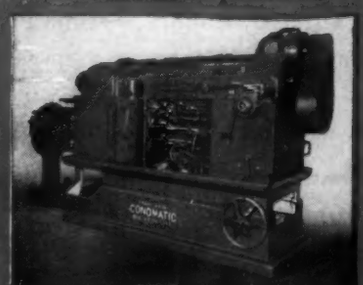
get ready with CONE for tomorrow

Another substitute for natural paint brush bristle is made of casein and was developed by the Eastern Regional Laboratory of the U. S. Department of Agriculture.

3 of these diameters are eccentric

This washing machine part, made of B-1112, is machined from round stock on a 1¼" 8-Spindle Conomatic in 10 seconds. Three of its five diameters are eccentric to .018".

Write to Cone for particulars.



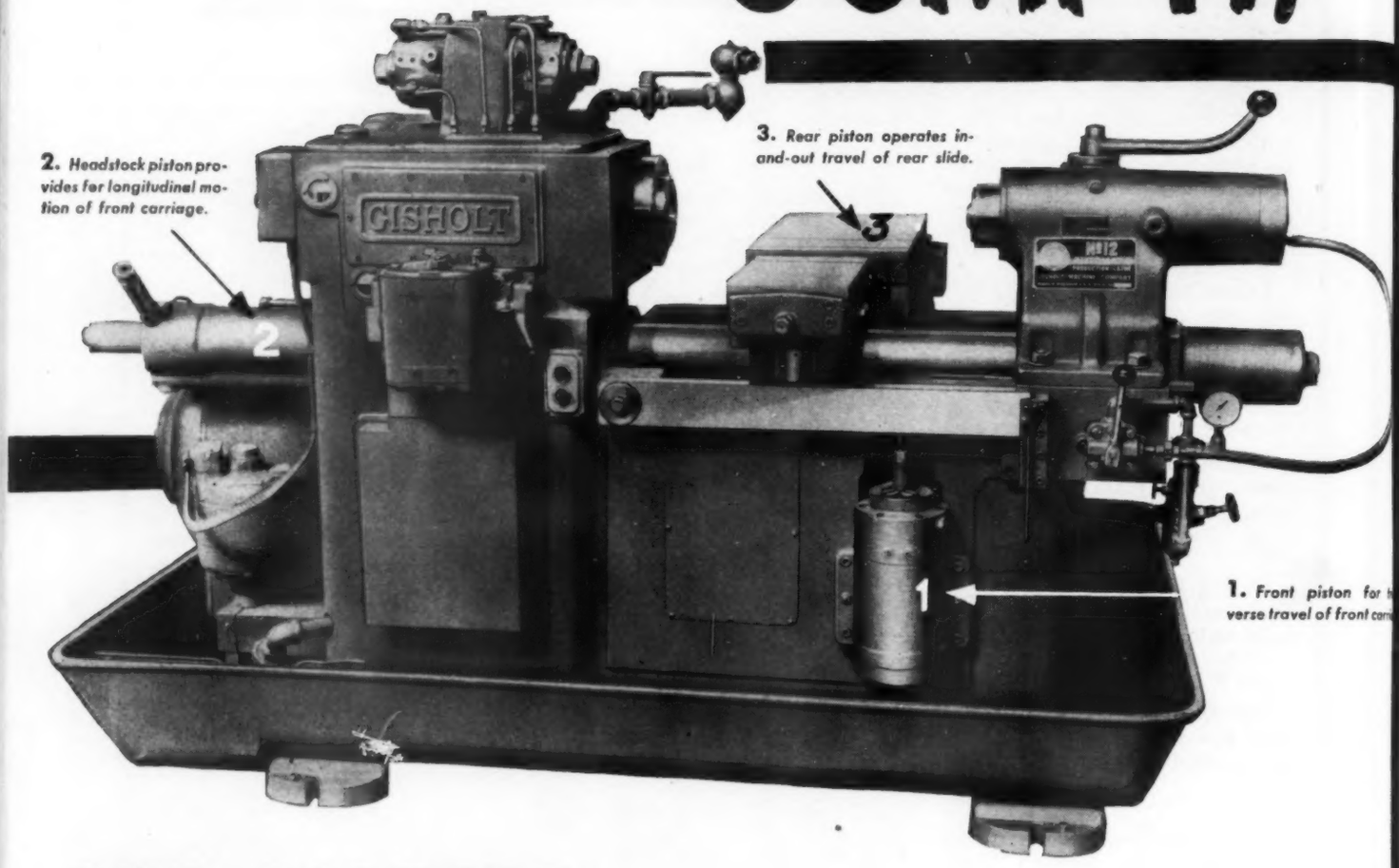
Ask your CONE representative to show you our new color motion picture

CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

26

operating cycle with "OOMPH!"


2. Headstock piston provides for longitudinal motion of front carriage.
3. Rear piston operates in-and-out travel of rear slide.
GISHOLT
1. Front piston for
verse travel of front

THE GISHOLT HYDRAULIC AUTOMATIC LATHE

You'll admire the way this husky little lathe goes about its business. Completely automatic, the operator has only to chuck the piece and touch the control valve handle. All tool travel—including rapid approach, feed during cut, tool fade-out, and rapid retract at the end of the cycle—is by hydraulic pressure. Three hydraulic cylinder units, as indicated above, actuate all tool movements.

The front piston elevates the guide bar, advancing front carriage tools transversely to cutting position. The headstock piston moves the front carriage longitudinally to complete the turning—after which tools fade away, both cross and lengthwise, by controlled, hydraulic relief.

Simultaneously, the rear slide piston advances tools rapidly and feeds them through the cut. Tools for both carriages are rapidly returned to starting position as soon as the rear slide has completed its work. At this point the driving clutch is disengaged and the spindle brake applied. The total machining time for the piece is the time of the longest cut.

This genuinely rugged automatic lathe performs equally well on arbor or between-centers work, chucking jobs, or work held in special fixtures. Write for complete details.

•

GISHOLT

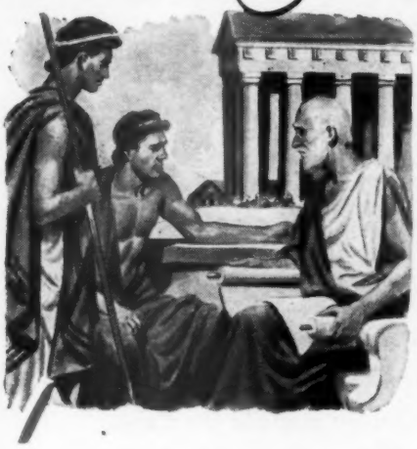
GISHOLT MACHINE COMPANY
1201 E. Washington Ave. • Madison 3, Wis.

Look Ahead..Keep Ahead..with Gisholt

TURRET LATHES - AUTOMATIC LATHES - SUPERFINISHERS - BALANCERS - SPECIAL MACHINES

Old Reliable Red Band Says—

"An ancient Greek called the turn"



When an ancient Greek philosopher once predicted that "Human slavery will continue until the loom weaves of itself," he really called the turn of important events to come. Events destined to free men from slavery . . . cut the costs of goods . . . raise the standard of living—

In early colonial days in our country, our forefathers were still spinning and weaving by hand, as the early Greeks did, to make clothing for the family. The driving force that was to mark another important milestone in man's progress, was still to be discovered—

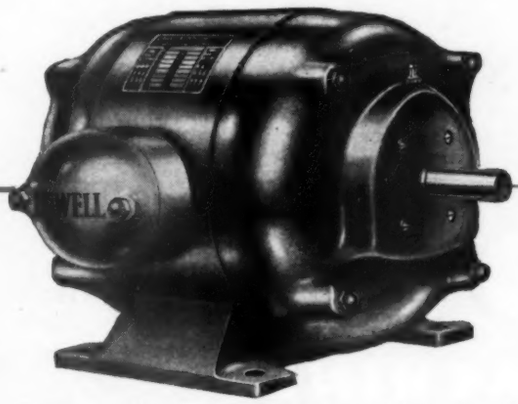
Today, not only the loom but machines, which make products numbering into thousands, turn by themselves with electrical horsepower. Howell—a specialist in industrial type motors for more than 30 years—builds motors for many of these machines from ¼ to 150 h.p.

Have you a hard job for Horsepower?

Years of specializing in making industrial type electric motors to meet the exacting requirements of the automotive, machine tool, dairy, food and other important industries, have enabled us to make Howell Motors better than ever.

Today, as always, Howell Motors are quality-motors. They are smooth-operating and quiet, too, because they are statically and dynamically balanced. They are better performing because they are built of the finest materials—copper or bronze rotors—and completely insulated. They are trouble-free on the job because they are designed for the toughest tasks in industry—consequently, they perform better on all jobs.

For your needs, in specialized or standard motors, from ¼ to 150 h.p., phone the nearest Howell Representative. Remember, you pay no more for industrial type Howell Motors . . . but you always get top quality for your money.



Howell Protected Type Motors available in sizes 5 h.p. and smaller. Also other sizes of Howell industrial type motors available up to 150 h.p.

HOWELL MOTORS

HOWELL, MICHIGAN

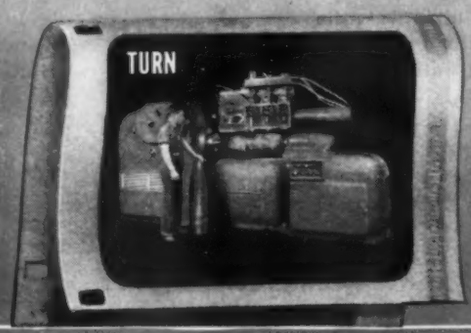
Manufacturers of Quality Industrial Type Motors Since 1915

Tools for Profit

A New Motion Picture with Narration by LOWELL THOMAS

A new Cross motion picture, "Tools for Profit", shows the latest developments in machine tools built around the particular needs of a product. In addition to covering many different types of metal cutting, it also shows the various steps in the Cross procedure of designing and building special machines—giving a clear picture of the savings that are possible through their use.

Running time of this film is 35 minutes. You may obtain it free of charge for showing to company groups, engineering societies or other interested technical organizations. Write The Cross Company, Detroit 7, Mich., Dept. 1.



S-29

MACHINE TOOLS

CROSS

ESTABLISHED 1898

SPECIAL MACHINES

TURNING · MILLING · DRILLING · BORING · REAMING · TAPPING · GRINDING

New York • Chicago • DETROIT • Cleveland • Cincinnati

LOWER COST PER PIECE THRU *Surface Broaching*

CUTTING the cost per piece through surface broaching provides the only available means left to produce some machined parts at a profit. In a great many cases surface broaching has shown remarkable savings in production time per piece as well as tooling maintenance costs when compared to conventional methods previously used. We will be glad to figure with you the advisability of using Footburt Surface Broaching Machines on your work. Just send blueprints and your hourly production required.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio

Detroit Office: General Motors Building

Footburt Patented Tooth For

FOOTBURT *Surface Broaching*

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NEW KRW HYDRAULIC PRESS BOOK of PROFITABLE PRODUCTION IDEAS

NOW AVAILABLE AS HAND-OPERATED ELECTRIC-OPERATED AIR-OPERATED *Presses...*

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11

85% OF ALL METAL-WORKING JOBS COVERED BY NEW CUTTING FLUID!

CINCINNATI — From the research laboratories of the world's largest machine tool builders comes news of a revolutionary cutting fluid. Named CIMCOOL, the new product covers eighty-five per cent of all metal-working operations requiring coolants. CIMCOOL most nearly approaches the ideal cutting fluid, it was pointed out, because it combines high cooling capacity and high friction reduction to a degree never before attained. Unique physical and chemical properties are responsible for the success of CIMCOOL, already tested on the production lines of many nationally-known manufacturers. Besides winning the approval of executives, CIMCOOL is also acclaimed by machine operators for its cleanliness and safety factors.

Need for High Efficiency Cited

WASHINGTON—American industry must reach a new high in production efficiency to meet the challenge of post-war competition, a spokesman for the nation's manufacturer declared today. "Our country," he said, "must produce the best possible goods at the lowest possible cost to meet public demands." Plant executives, throughout industry, must acknowledge this situation if they are to enjoy prosperity.

The group will meet tomorrow in its Main Street clubrooms to name committees and formulate plans for the coming campaign, the chairman stated. Committees will begin

It's big news for production men when a new product appears to help them meet the challenge of peak production efficiency! *And that product is here!* It's CIMCOOL, the multi-purpose cutting fluid offering you the lowest unit cutting fluid cost on record! You can translate this welcome news in the coolant field to still better news on the production line. Just SPECIFY CIMCOOL!

DIVISION OF

★ CIMC

For HIGH Production Efficiency—For LOW Unit Cutting Fluid Cost

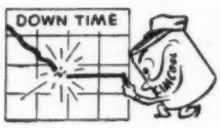
CIMCOOL helps increase production rates. Increased cooling capacity permits higher cutting speeds and feeds. Grinding wheels cut more freely. Low surface tension allows small chips and grit to settle out rapidly.

CIMCOOL is tops with operators. It restricts bacterial growth, does not contain animal or vegetable oils subject to rancidity, and is not a skin irritant. Smoke, objectionable odors and hot chips are eliminated.

CIMCOOL helps increase tool life. Chemical lubricity reduces tool wear. Tools are kept cool to touch. Increased wetting action permits greater penetration between tool and chip.

CIMCOOL is safest. Fire hazards are eliminated. Absence of slippery film on operator's hands, machine controls, work and floor reduces danger of accidents. Restriction of bacterial growth limits risk of infection.

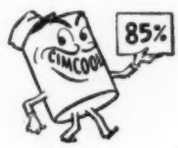
CIMCOOL reduces downtime on machines. Fewer tool changes and fewer changes of cutting fluid are necessary. Pump and supply lines are kept clean. No spoilage.

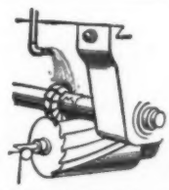


CIMCOOL contains a rust inhibitor good for the life of the fluid for protection of machine and work. It does not contain any chromates or highly alkaline components which may be irritating.

CIMCOOL facilitates accuracy. Freer cutting reduces pressure. Uniform temperature is maintained on work and on machine. Dirt does not stick to work or gages, permitting faster, more accurate gaging.

CIMCOOL is applicable to 85% of all metal-working operations requiring cutting fluids. It replaces all water emulsions and all but very highly compounded specialty oils for selected jobs.



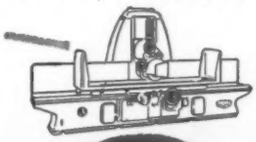


A case in point

The Staples Tool & Engineering Company of Cincinnati have replaced a conventional sulphur base cutting oil on milling machines with CIMCOOL diluted in 40 parts of water. They are using both high speed steel and carbide form cutters milling flutes and tangs on milling cutter and reamer bodies made from carburized nickel-chrome-moly steel. They report that feeds and speeds were increased 10%, cutter life was increased 300%, and operator's satisfaction was increased immeasureably because of the coolness, cleanliness, and freedom from smoke and odor while using CIMCOOL.

THE CINCINNATI MILLING MACHINE COMPANY Cincinnati 9, Ohio, U.S.A.

The Multi-Purpose Cutting Fluid



OOL

Check • Clip • Mail

Manager, CIMCOOL Division
Cincinnati Milling Machine Co.
Cincinnati 9, Ohio, U.S.A.

AM-3

_____Please send me a copy of "What Is Cimcool?"

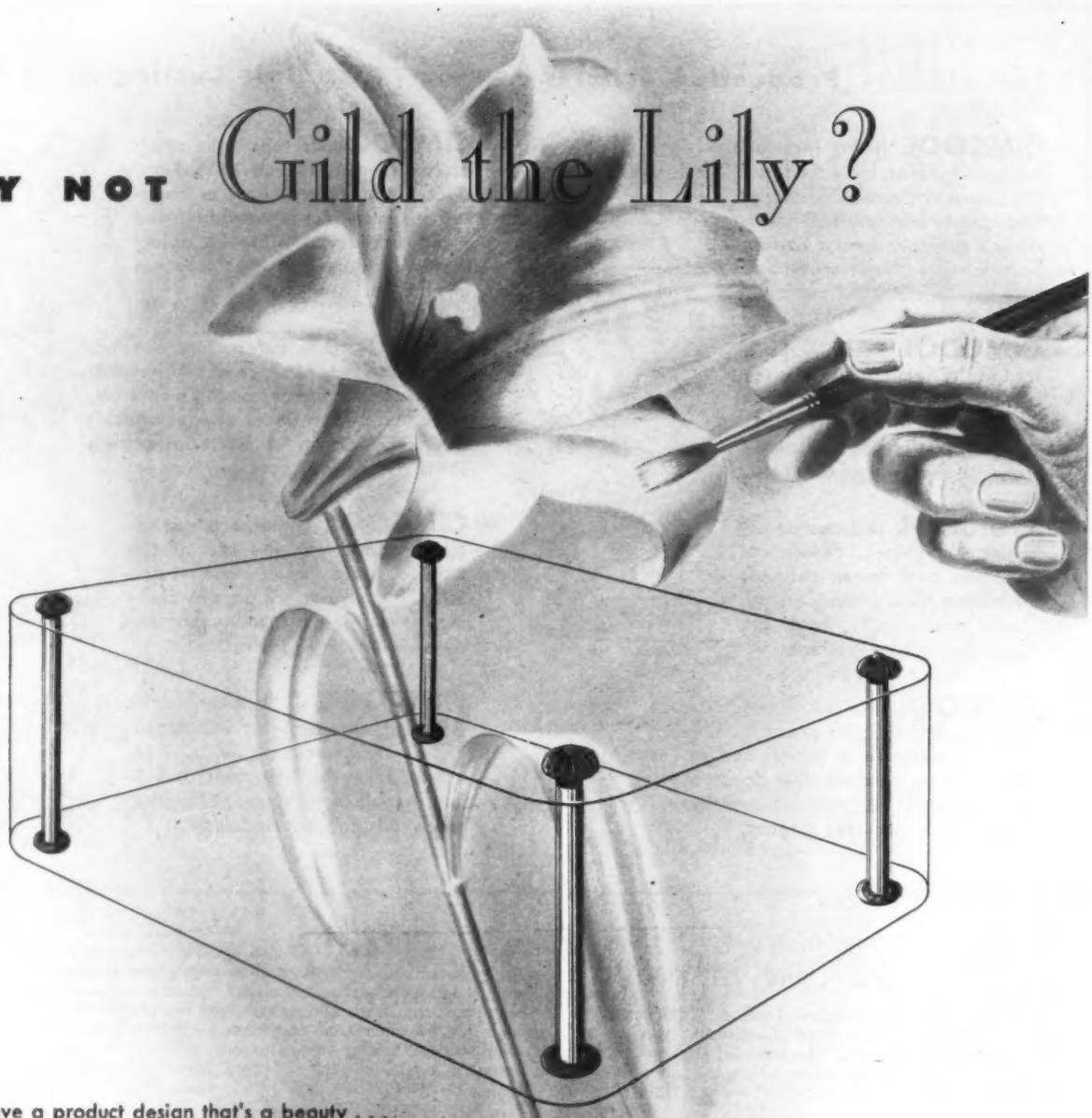
_____Please have sales representative call.

Name_____

Company_____

City_____ State_____

WHY NOT Gild the Lily?



You have a product design that's a beauty . . .
to be produced in plastic, leather, wood or metal.
It has to be held together in some way, so why not make Alcoa Aluminum fastening devices part of the design?
Alcoa Aluminum can be given any number of attractive and unusual finishes and colors which give added eye appeal.
Product designers and manufacturers should have Alcoa's booklet, "Finishes for Aluminum", to help them use aluminum fastening devices to better advantage.
Call the nearby Alcoa office for a copy, or write ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA ALUMINUM

VAN DORN WELDMENTS

WELDED STEEL CONSTRUCTION

has had the widest and most general expansion of any fabrication method developed in the last thirty years.

for MODERN MACHINES

FRAMES • BASES • PARTS

Van Dorn weldments are precision products . . . fabricated with all the skill that comes from years of specialized experience. Van Dorn weldments bring to modern machines the multiple advantages of greater strength, lighter weight, smoother appearance, better design. They eliminate patterns, permit economical design changes and reduce machining expense.

Van Dorn is well equipped to meet your weldment requirements with . . . experienced design engineers and complete manufacturing facilities. Consultation is invited.

Write for the Van Dorn book, "Fabricated Machine Supporting Units." No obligation.

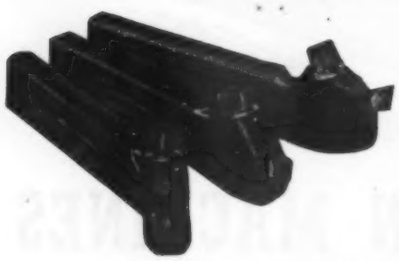
THE VAN DORN IRON WORKS CO.

2685 EAST 79TH STREET CLEVELAND 4, OHIO

ARMSTRONG

ARMSTRONG HIGH SPEED ARMALOY ARMIDE

Correct ARMSTRONG TOOL HOLDERS and correct Cutter Bits for every machining speed and every machinable material

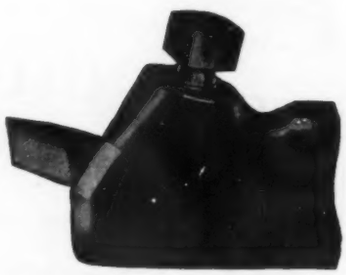


The Armstrong System of Tool Holders provides correctly designed ARMSTRONG TOOL HOLDERS for every operation of lathes, planers, slotters and shapers and for many turret lathes and screw machine operations. It also provides proper types of cutters, bits and blades for every cutting-speed and material.

- For general tool room and machine shop use ARMSTRONG HIGH SPEED Bits and Blades are unsurpassed. They will stand up to speeds and feeds far greater than those generally accepted as "standard".

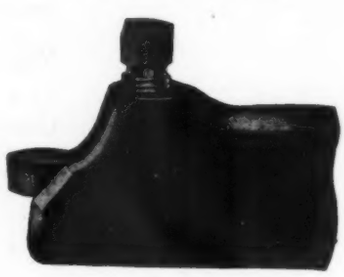
- ARMALOY Bits and their corresponding ARMSTRONG CA TOOL HOLDERS are recommended for machining sand-filled castings, malleable iron, non-ferrous metals, rubber, plastics and for machining steel on modern high production machines, where sufficient speed and feed can be obtained to take advantage of their greater cutting capacity.

- ARMIDE Carbide Tipped Cutters and ARMSTRONG Carbide Tool Holders, make the use of Carbide-tipped tools practical in even the smallest shop. Coming in two grades ARMIDE Red (for steel) and ARMIDE Gray (for cast iron, brass, aluminum and non-ferrous materials). They easily machine hard and tough steels, and stand up to the highest speeds and heaviest feeds, and increase the interval between tool re-grindings as much as 10 to 50 times.



ARMSRONG TOOL HOLDERS for HIGH SPEED CUTTERS

ARMSTRONG CA TOOL HOLDER for ARMALOY CUTTERS



ARMSTRONG *Carbide* TOOL HOLDERS for ARMIDE CUTTERS

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

315 N. FRANCISCO AVENUE **CHICAGO 12, U. S. A.**

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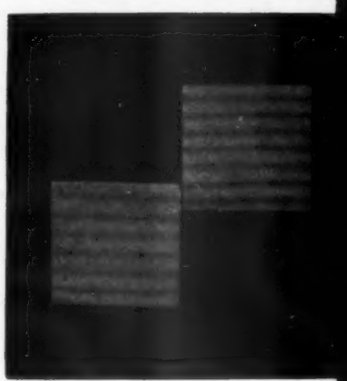
Pacific Coast Whse. & Sales Office: 1275 Mission St., San Francisco 3, Calif.

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

Van Ke

THE LAST MILLIONTH

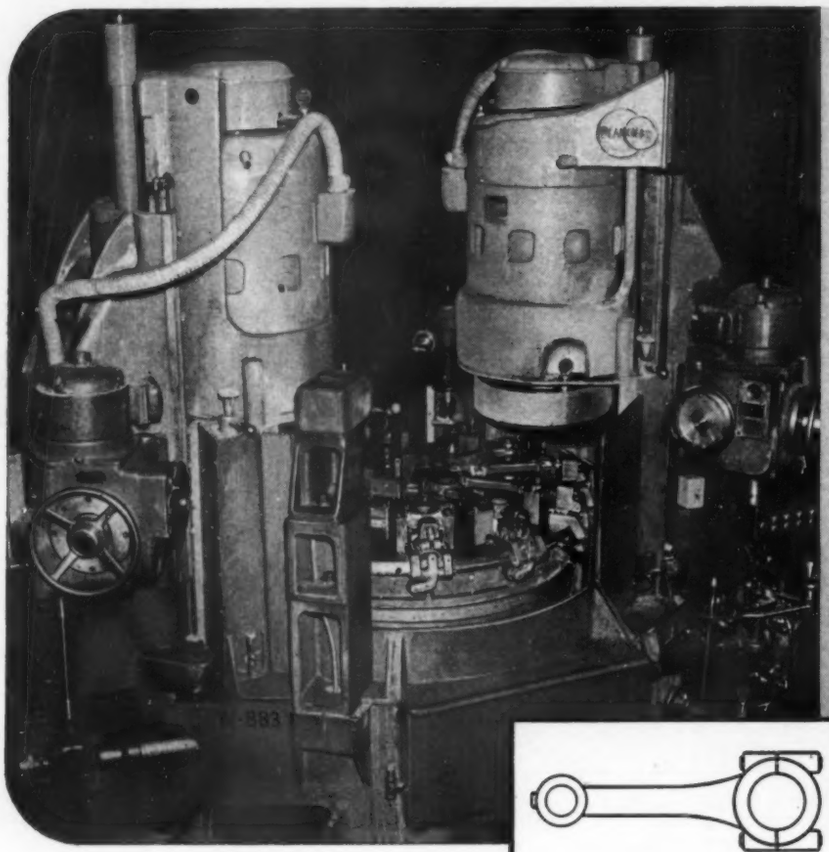
Light wave bands show that two Van Keuren Solid square Master Blocks are flat and parallel to the last millionth of an inch. The square design permits this accuracy to be produced and maintained.



Van Keuren

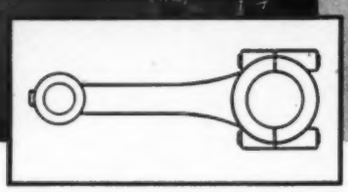
27th YEAR

"Put it on the Blanchard"



GET THESE *Advantages*

- Production ✓
- Adaptability ✓
- Fixture Saving
- Operation Saving ✓
- Material Saving
- Close Limits ✓
- Fine Finish
- Flatness ✓



Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

These steel forged connecting rods are ground both sides of both ends on a No. 16-A Dual Blanchard Automatic Surface Grinder with a 43" chuck. The special 12-station fixture was designed and built by Blanchard.

From each side of both ends .012" of stock is removed to limits of ± .0005".

The production is at the rate of 400 surfaces per hour, or 100 completed pieces.

The 16-A Dual Blanchard is equipped with two grinding wheels, each with automatic size control, thus insuring the finished dimension.

Put it on the Blanchard for more economical production.

BLANCHARD

The **BLANCHARD** MACHINE COMPANY

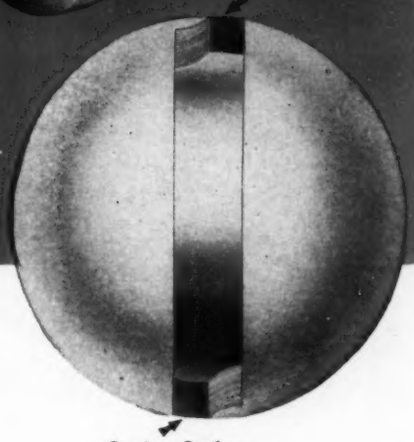
64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

What You Can Do with the * DuBo Gage

STANDARD

SINGLE END
Sizes 1.510" to 6.010"
(38 to 152 mm)

DOUBLE END
Sizes .240" to 1.510"
(6 to 38 mm)



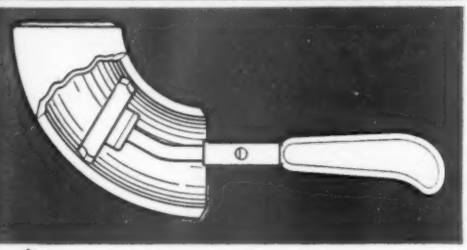
First

You can check plain, ordinary holes . . .

faster because the DuBo Gage is light, easy to enter (no pilot necessary).

better because you can check dimensional deviations such as taper and out-of-round.

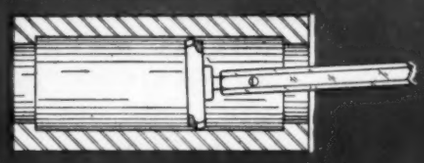
GOES AROUND CORNERS



And

You can do other things with the DuBo Gage that you can't even begin to do with a cylindrical plug gage.

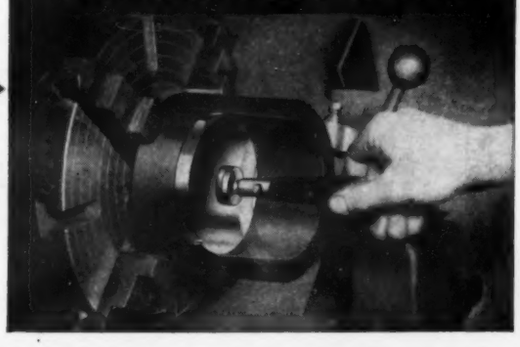
GETS BY CONSTRICTIONS



With the DuBo Gage you can even check around corners. Illustration shows a DuBo Gage with specially shaped shank for checking I.D. of an elbow at any point.

Taper enlarging away from the opening can be detected with DuBo Gage without removing part from the machine.

DETECTS BACK TAPER



Diameter of entrance of this bore is, by design, .005" to .008" less than central section which is to be checked. DuBo Gage can be entered through constricted opening, and larger diameter can be checked with ease.

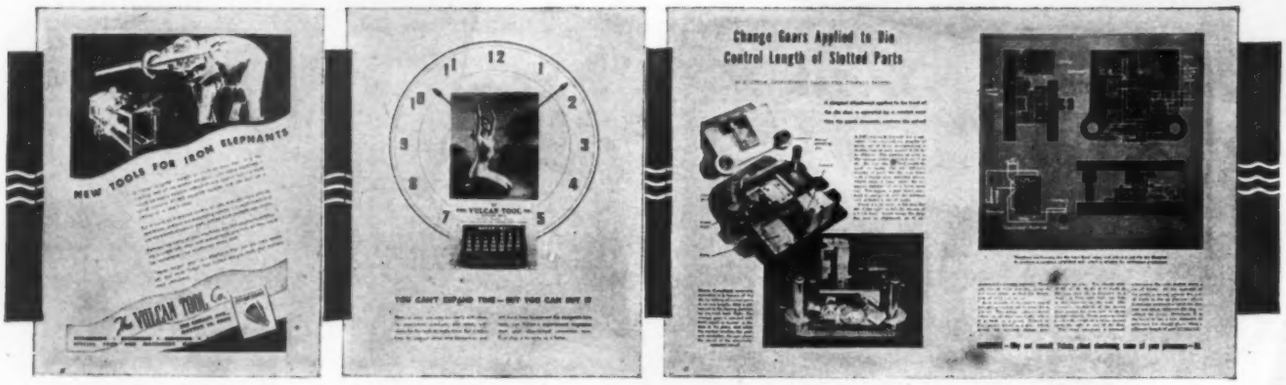
Send us *your* bore checking problem for engineering review and recommendation.

Write for Bulletin

*Patents Pending

See the DuBo Gage and other STANDARD GAGE developments at ASTE New Era Exposition

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.


NEW TOOLS FOR IRON ELEPHANTS
The VULCAN TOOL Co.
YOU CAN'T EXPAND TIME—BUT YOU CAN SAVE IT
Change Gears Applied to Die
Control Length of Slotted Parts

Item D 1 Vulcan advertisements dealing with the significance of better tools are appearing regularly in Tool Engineer, American Machinist and Production Engineering and Management. These are reprinted as reminder circulars and will be gladly mailed to any individual who wishes to keep in touch with us.

Item D 2 Interesting and well illustrated magazine articles by Vulcan's Head of Manufacturing Operations, Mr. Gordon Letsche, have appeared from time to time in various metal trade publications. They show how some difficult tooling problems have been solved. We will be glad to send reprints as long as our supply lasts.

Items D3 and D4 The twenty-four page brochure "Vulcan Service to you in the Post-War Economy" discusses the future of American business and the function of special mass production tools and techniques. Item four "For you it's important" is a broadside stating why Vulcan purchased a new plant and machinery.

Item 5 If you are interested in a facilities list describing one of the half dozen best equipped tool building plants in the Western Ohio area ask for item five and a broadside now in preparation will be sent you when ready. Meanwhile item three carrying a list owned prior to purchase of the new plant will be sent.

What Vulcan does for you

ENGINEERING • PROCESSING • DESIGNING
BUILDING • DIES • JIGS • GAUGES • FIXTURES
SPECIAL MACHINERY MANUFACTURING
VARIOUS CONTRACT SERVICES

Here's how Vulcan does it

Its record of performance, its physical and mental equipment, its organization, policies, and outlook are interestingly described and documented in the various pieces of literature mentioned above. Please request what you want on your company's letterhead.

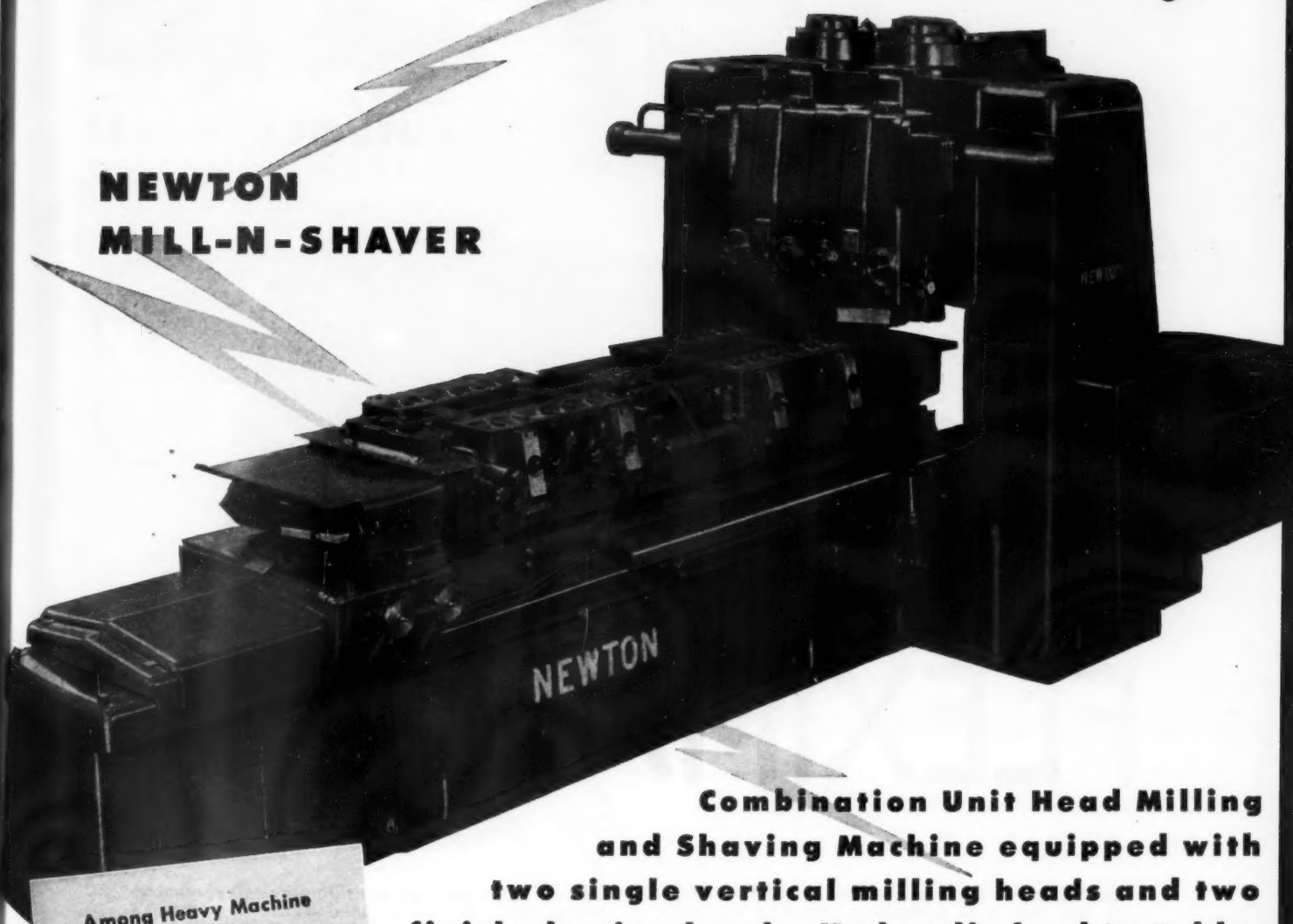
The VULCAN TOOL *Co.*

730 LORAIN AVE. **DAYTON 10, OHIO**

"At the sign of good tool design"

TWO SEPARATE OPERATIONS in the time required for rough milling—alone!

NEWTON MILL-N-SHAVER



Combination Unit Head Milling and Shaving Machine equipped with two single vertical milling heads and two finish shaving heads. Hydraulic feed to table.

The Newton Mill-N-Shaver performs two complete operations at one pass of the table. It rough mills at milling speed and finish shaves on the return, at the rapid traverse speed. This machine produces a perfect gasket surface. Two separate operations in exactly the time ordinarily required for rough milling alone. The Newton Mill-N-Shaver is designed to both step-up your production and reduce your costs on the types of work for which this machine is adapted. For detailed information, write for Bulletin No. 580.

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER
SPECIAL MACHINES

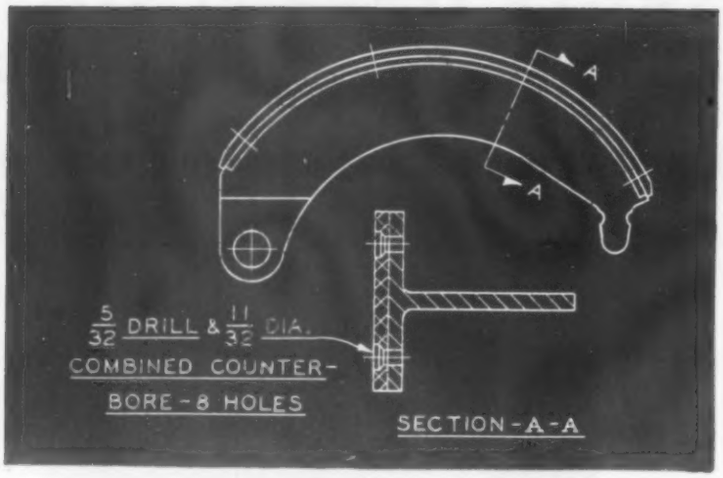
BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1861

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

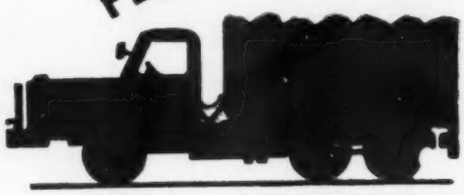
CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

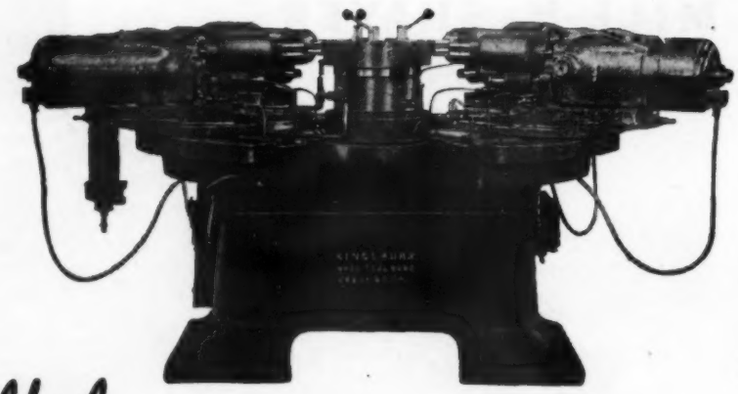


THIS IS A FLEXIMATIC



AUTOMOTIVE JOB!

Brake Shoe and Lining Production Speedily and Accurately Handled



FLEXIMATIC

by KINGSBURY

One important advantage of the FLEXIMATIC is the fact that it is a machine providing automatic indexing for performing various machining operations in a single chucking of the work.

This method is specifically applied to the Model GD Eight-Spindle Fleximatic arranged for drilling and counterboring brake shoes and linings shown in the accompanying drawing. Many variations of the machine are available, some for lining only and others for shoes only.

The FLEXIMATIC system pioneered by Kingsbury, involves a single base on which is mounted an indexing turret and standard metal cutting units for each operation such as drilling, reaming, counterboring, etc. The turret is designed to receive a number of duplicate work holding fixtures and can be rotated intermittently under control of the operator for presenting fixtures to loading and working stations. While units are in action, the turret is locked securely. All automatic operations are performed simultaneously while the operator removes a finished part and replaces it with a rough part at the loading station.

Speed, accuracy and easy handling even by unskilled operators are inherent in the performance of FLEXIMATICS.

Write today for illustrated Bulletin showing a number of different set-ups

KINGSBURY MACHINE TOOL CORPORATION

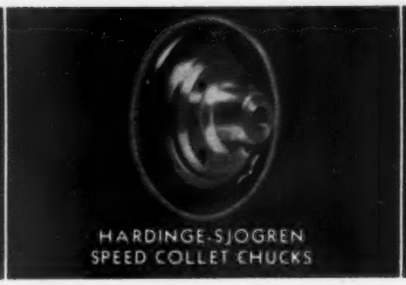
KEENE NEW HAMPSHIRE U.S.A.

ISIT HARDINGE ELMIRA, N.Y. EXHIBIT SPACE NO. 1914

At the A. S. T. E. Cleveland Exposition, April 8 - 12

You will see Precision Accessories for Tool Rooms

)INGE LATHE COLLETS



HARDINGE-SJOGREN
SPEED COLLET CHUCKS

HARDINGE COLLET INDEX FIXTURES

HARDINGE CENTER SETS

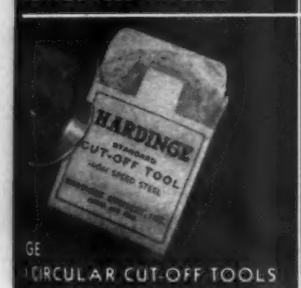
and Precision Accessories for Screw Machine Departments

RDINGE FEED FINGERS

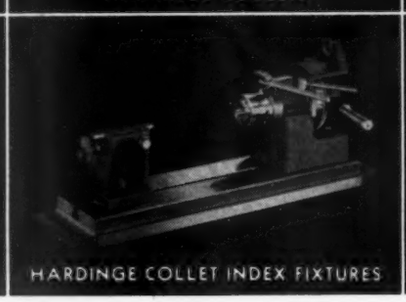
HARDINGE COLLETS

HARDINGE MASTER FEED FINGERS

HARDINGE
MASTER COLLETS AND PADS

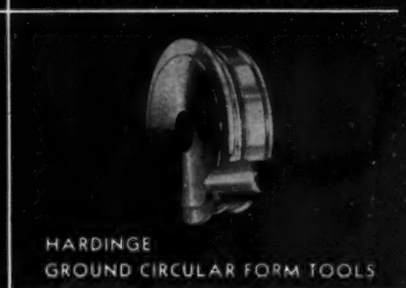


GE
CIRCULAR CUT-OFF TOOLS



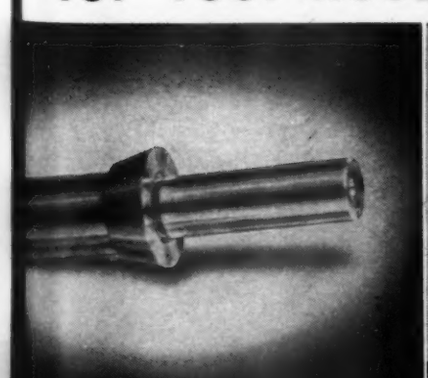
HARDINGE COLLET INDEX FIXTURES

HARDINGE COLLETS

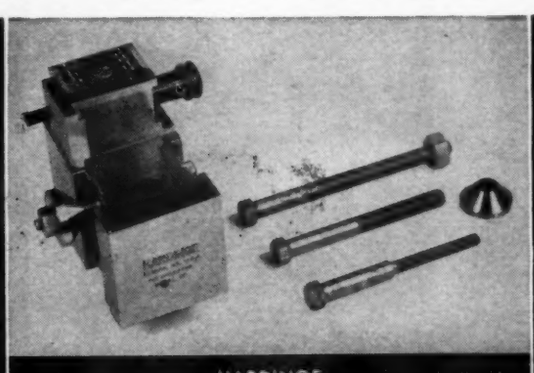


HARDINGE
GROUND CIRCULAR FORM TOOLS

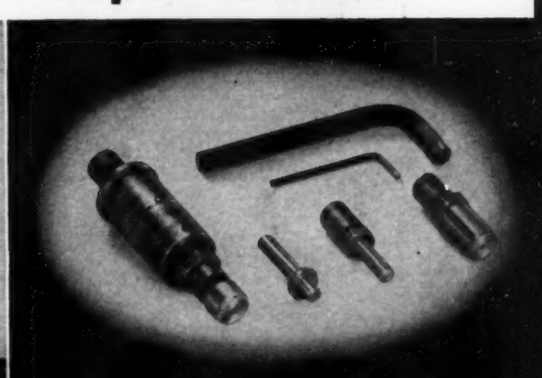
also Three Entirely New HARDINGE Products for Tool Rooms and Production Departments



ARDINGE COLLET SEAT GAGES
BROWN AND SHARPE AUTOMATICS



HARDINGE
SHARPENING AND CHECKING FIXTURE
FOR ALL TYPES OF CIRCULAR FORM TOOLS



HARDINGE UNIVERSAL COLLET STOP SET
FOR 1" CAPACITY LATHE COLLETS

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

SNYDER PRESENTS A NEW DEVELOPMENT IN RAILROAD CAR WHEEL BORING

This special-purpose, automatic-cycle machine is designed and built by Snyder specifically for rough and finish boring wheels for railroad cars.

Its particular significance to railroads and to other industries employing comparable metal-cutting techniques on large, heavy castings, is that this machine combines improved accuracy with increased production rate and is engineered to maintain its efficiency over an estimated lifetime of 20 years. In these respects it constitutes a definite advance over existing practice.

On steel wheels, the cutting time for finish boring ⅛" stock per side is 1 minute 20 seconds for a hole 7" long and 7" diameter. The same amount of stock is removed from cast iron wheels in 50 seconds. Cutting tools are T. C. tipped.

Chamfering and facing a 1½ flange may be performed simultaneously with the boring operation.

A 19" stroke is provided so that rough and finish boring may be performed in succession. (On the set-up shown, rough and finish tools are mounted close together so that operations are, in part, simultaneous.)

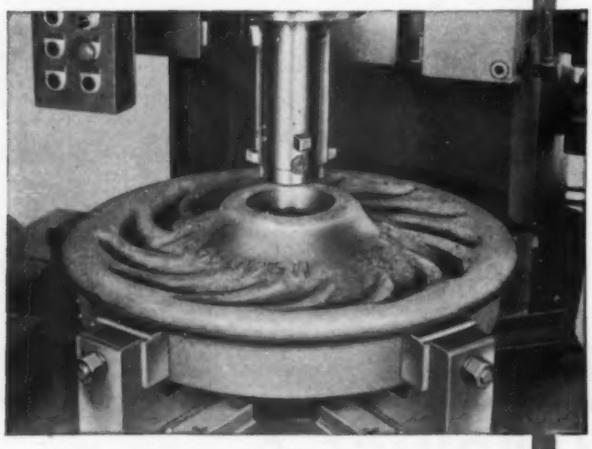
Spindle feeds are from 2" to 24" per minute and various spindle speeds are provided through the use of a four-speed selective transmission or a variable speed motor. Spindle is heavy-duty with taper roller bearing mounting.

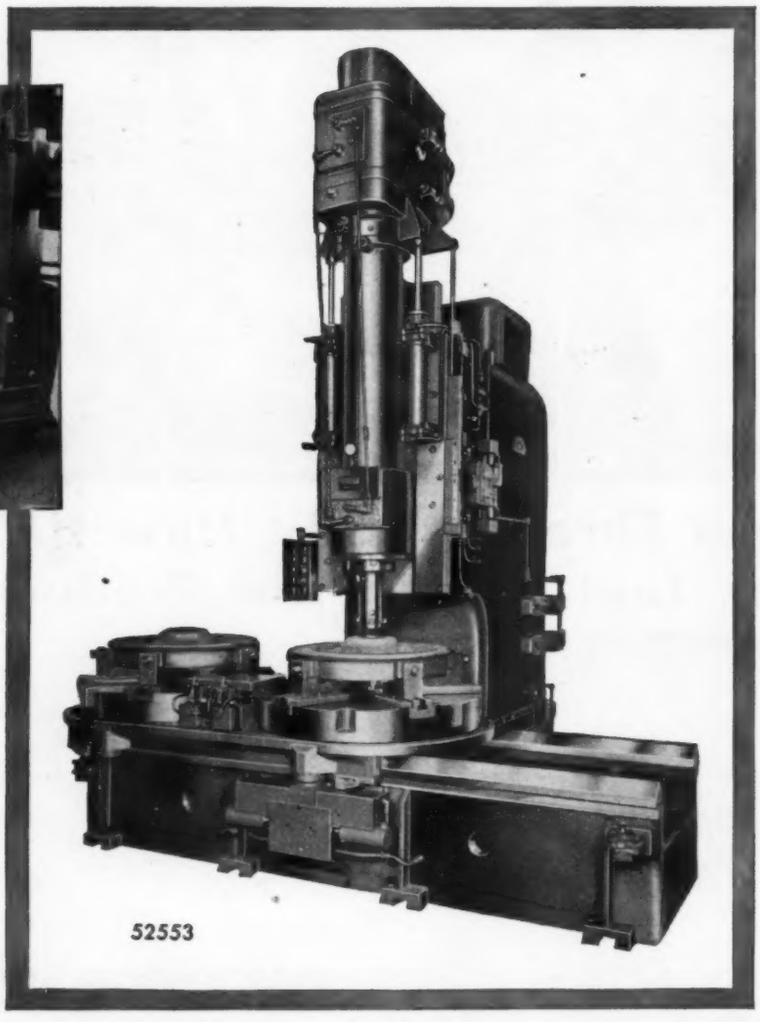
The table travels upon V-ways, case-hardened, ground and automatically lubricated to provide smooth operation. The V design allows for normal wear without side-play which would impair accuracy. Table travel is by hydraulic actuation with 5-second time interval.

Work is held by two 5-jawed chucks of 42" capacity, operated by individual hydraulic cylinders. Work-cycle is automatic. Capacity is 20 H.P. for a finishing machine and 30 H.P. for a roughing machine.

The advances represented in this machine—greater accuracy, higher production, longer life, automatic operation (practical for unskilled help), maximum safety—are typical of the advantages offered in Snyder-engineered special-purpose machines.

We invite your inquiries. Snyder Tool & Engineering Company, 3400 E. Lafayette, Detroit 7, Michigan.





52553

SNYDER

DESIGNERS AND BUILDERS OF MACHINERY FOR HIGH PRODUCTION AT LOW UNIT COST

21 Years of Successful Cooperation with Leading American Industries

SEE SNYDER EXHIBIT

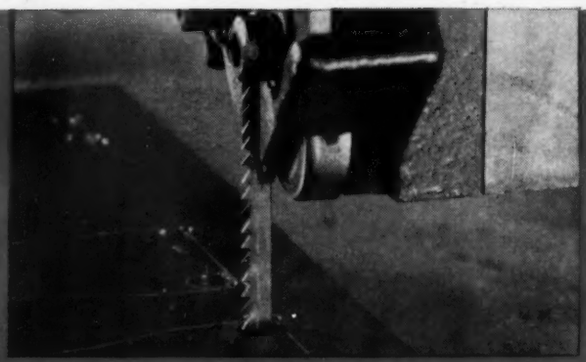
Booth 208, New Era Exposition

CLEVELAND, April 8-12

SIMONDS gives you the right Band Saw to deliver Top Output and Economy in cutting any type of Metal or Plastic

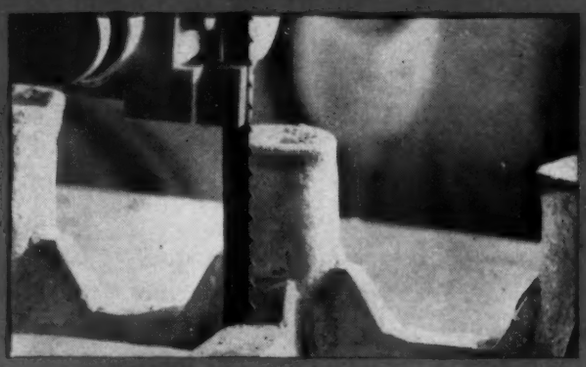
1. REGULAR HARD EDGE BAND SAWS

Simonds Steel Mills produce a special tough alloy steel for these saws. Teeth are sharp, perfectly milled, and set even on both sides of blade, to give clean, easy cutting and long saw life. And joints are welded for equal strength with rest of blade.



2. SKIP-TOOTH BAND SAWS

Here's the extra gullet-capacity for large chips from aluminum, magnesium, plastics and wood. These saws stay sharp so long that it's economical to replace them and save resharpening. They have the same hardened tooth-edge as the Regular Hard Edge Saws. Made in widths from ½" to 1" Tooth-spacings: 2, 3, 4, and 6 per inch.



3. SPRING TEMPER BAND SAWS

Especially successful in sawing thin sheet aluminum, magnesium, and steel . . . also brass, light structural shapes, plastics, fibre, non-ferrous tubing and similar materials. These blades cut for exceptionally long periods without dulled teeth . . . and then they are quickly reset and filed and put back on the machine.

Consult your Industrial Supply Distributor about the best type and specification of Simonds Band Saw for your work. Or write the nearest Simonds office.

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.

Branch Offices:
1350 Columbia Road, Boston 27, Mass.; 127 S. Green St., Chicago 7, Ill.; 416 W. Eighth St., Los Angeles 14, Calif.; 228 First St., San Francisco 5, Calif.; 311 S. W. First Ave., Portland 4, Ore.; 31 W. Trent Ave., Spokane 8, Wash.; *Canadian Factory:* 595 St. Remi St., Montreal 30, Que.

And now to get into high gear...

IMPROVED OHIO OIL LUBRICANTS ARE READY TO HELP YOU GET FASTER, BETTER PRODUCTION IN EVERY METAL WORKING OPERATION

HOW CAN PRODUCTION be speeded up? What can be done to get lagging schedules into high gear?

You're probably asking those questions, today, as urgently as many a company asked them during the war. And answers found then, by Ohio Oil lubrication research, may be the answers you're looking for, right now.

For wartime research . . . and continuing research since the war . . . have developed Marathon *cutting* oils, for instance, that permit greatly increased cutting speeds that lengthen tool life and assure finer finish in metal work.

Marathon *grinding* oils have been developed which have increased work speeds on specific jobs as much as 100%, lengthened time between wheel dressings as much as 80%.

You'll find important Ohio Oil developments in lubricants for almost every metal-working operation. They're developments you'll want to learn about —quickly. Why not write, wire, or phone, today? Ask for an Ohio Oil lubrication engineer to call with complete facts.

A COMPLETE LINE OF CUTTING AND GRINDING OILS FOR EVERY METAL-WORKING OPERATION

MARATHON

THE OHIO OIL COMPANY

Producers of Petroleum Since 1887

GENERAL OFFICES: FINDLAY, OHIO

District Offices: Robinson, Ill., Indianapolis, Ind., Louisville, Ky.

● The widespread use of triple-alloy steels containing Nickel, chromium and molybdenum is based on extensive experience in widely divergent engineering fields.

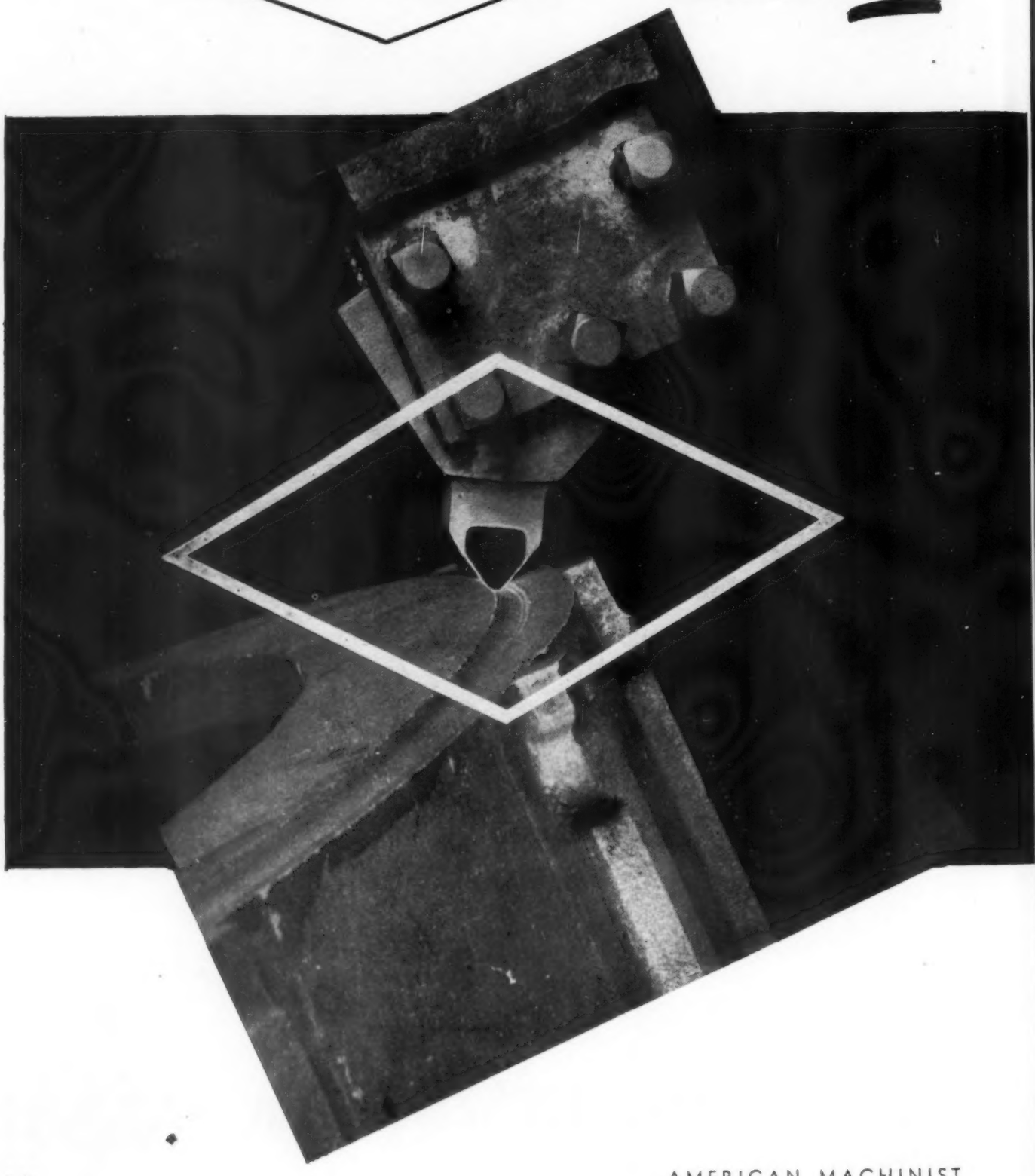
It has been found that they can be counted on for consistent performance. The depth to which full hardness is developed is comparable to that attained by other alloy steels. Their response to heat treatment is dependably uniform.

Moreover, the wide range of compositions available, makes it possible to select *accurately* suitable alloy steels for a broad range of applications.

Inquiries regarding the selection and uses of triple-alloy steels containing Nickel are invited.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street New York 5, N. Y.

FIRTHITE faced 32



62 AMERICAN MACHINIST

instead of 6 pieces per grind

Conditions:

- Depth of cut . . . . . 3/8"
- Feed per revolution . . . . 1/32"
- Cutting speed . . . . 235 feet per minute

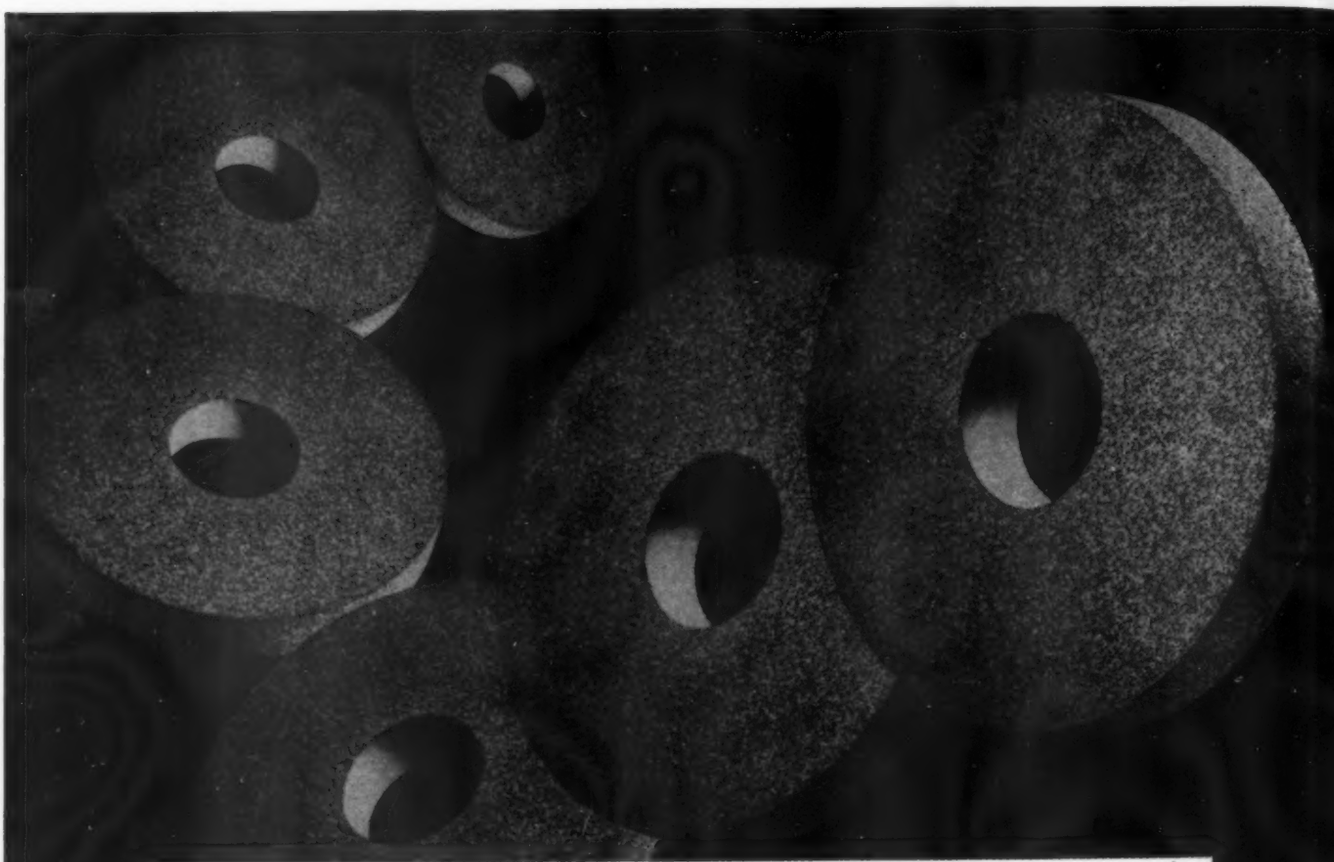
Cutting speed was also increased from 100 feet per minute to 235 feet per minute. No wonder the customer said, "A marvelous work value on this job."

If YOU have a cutting problem . . .

Call **Firth-Sterling**

STEEL COMPANY

McKeesport, Pa.—New York, Hartford, Philadelphia, Pittsburgh, Cleveland, Dayton, Detroit, Chicago, Los Angeles



Meeting individual requirements *on every count*

When you order grinding wheels from Peninsular you can be sure they will fit your requirements because *they're made to fit.*

Every wheel that Peninsular makes is especially *engineered* to the individual problems of the job on which it will be used —*designed* and *processed* to meet those problems on every count.

That's why so many manufacturers with difficult grinding jobs are turning to Peninsular grinding wheels.

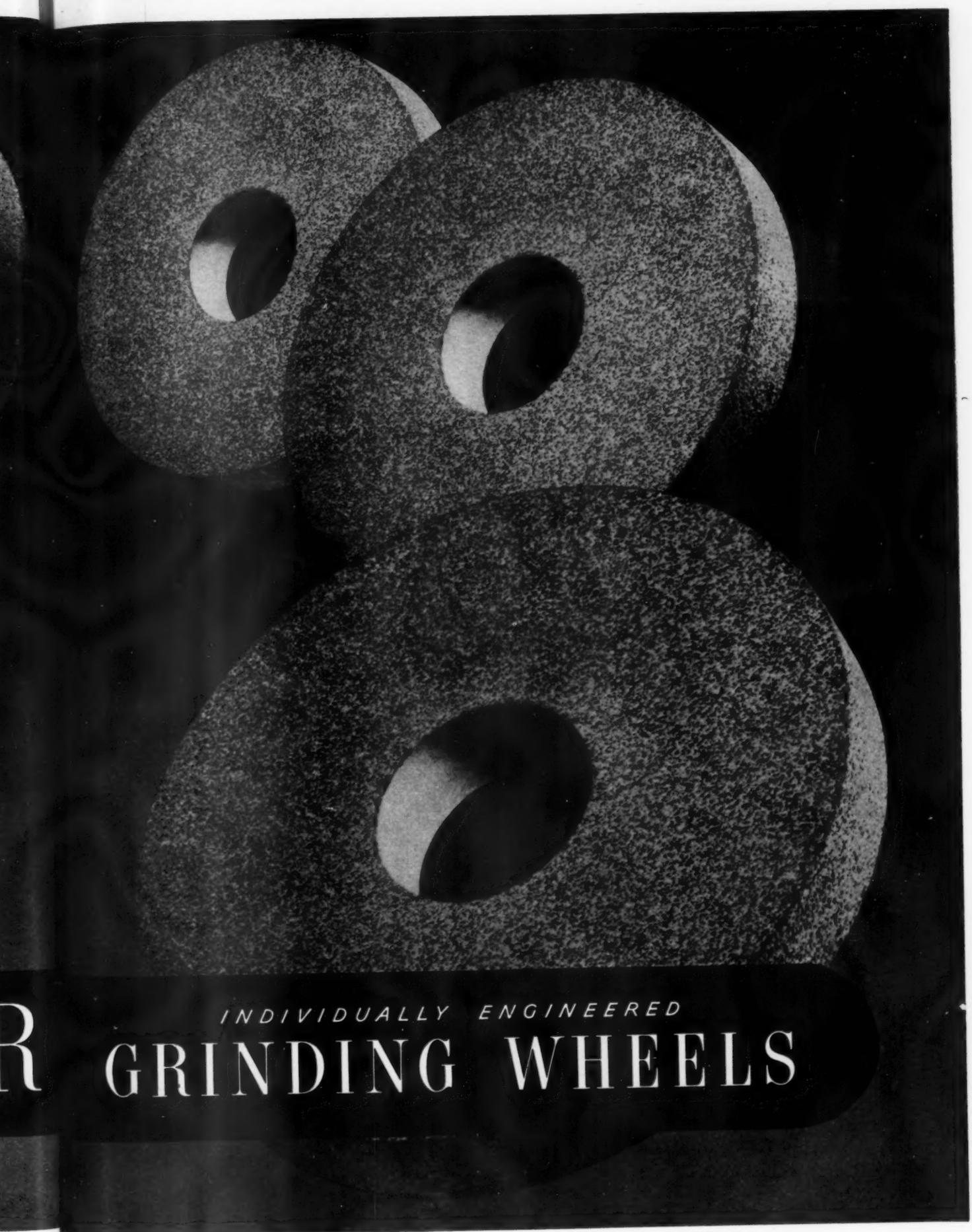
Peninsular factory and field engineers have a production, engineering and cost analysis service beyond any offered up to now in the industry. We'll stake our reputation that they can help you—no matter how difficult your grinding problems may be!

The Peninsular Grinding Wheel Company, 729 Meldrum Ave., Detroit 7. Sales Offices: Chicago, Philadelphia, Cleveland, Newark, Pittsburgh, Houston, St. Louis.

PENINSULAR

SINCE 1889

SPECIALISTS IN RESINOID BONDED WHEELS


INDIVIDUALLY ENGINEERED
GRINDING WHEELS

Meeting individual requirements *on every count*

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The Peninsular Grinding Wheel Company, 729 Meldrum Ave., Detroit 7. Sales Offices: Chicago, Philadelphia, Cleveland, Newark, Pittsburgh, Houston, St. Louis.

PENINSULAR

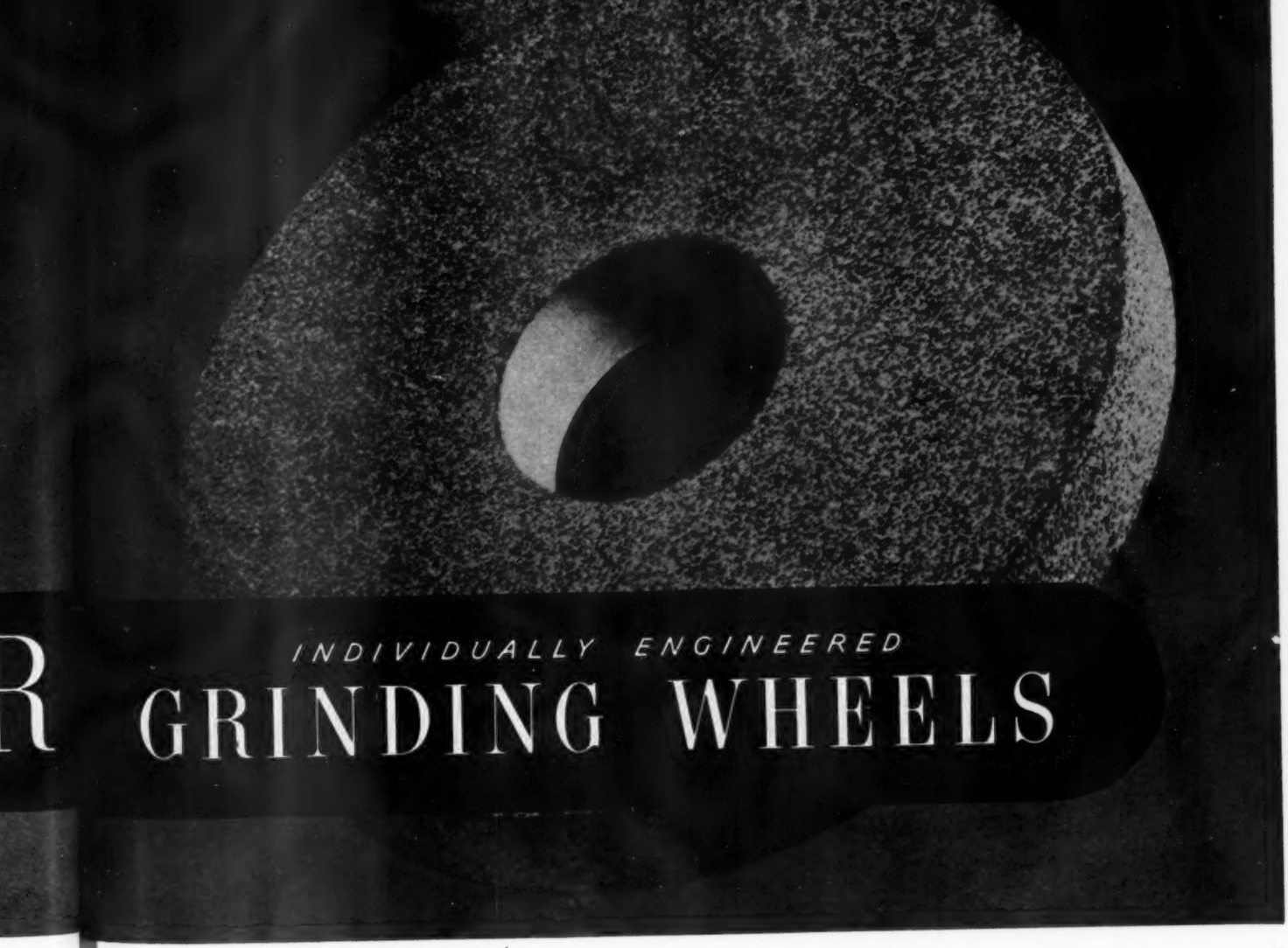
SINCE 1889

SPECIALISTS IN RESINOID BONDED WHEELS

COLLETS

Guaranteed *

TO RUN



INDIVIDUALLY ENGINEERED

R GRINDING WHEELS

COLLETS

Guaranteed *

TO RUN DEAD TRUE

Work held in a Rivett Collet is guaranteed to run "dead true" at the Collet mouth and within .002" two inches from the Collet mouth. Rivett Draw-In Collets are available in all standard styles for bench lathe, engine lathe, miller and grinder use.

They have personality derived from a worthy inheritance and a steadily improved environment. When shipped, each Rivett Collet reflects more than fifty years of Collet manufacturing "know-how" and the most advanced machining and inspection.

See how the individual cartons permit you to read easily through the "window" the style, size and Rivett name. This distinctive packaging provides protective storage with absolute identification.

* For complete information on all Rivett Collets and their adaptation to existing machines write for Bulletin 100C.

RIVETT

RIVETT LATHE & GRINDER, Inc.

BRIGHTON · BOSTON · MASS · U S A

BULLETIN NO. 100C

For 300 to 1000% More Holes Per Tap!

What Are Electrolized Taps?

Electrolized Taps are taps of the finest precision workmanship treated by a remarkable new process that combines *high voltage with a chemical bath and a rare metal to produce a super-hard yet ductile surface on the cutting edges.*

What Can Electrolized Taps Do for You?

Electrolized Taps multiply tap life 3 to 10 times as a result of the extreme hardness of the case with which the cutting edges are fortified. Wear resistance is enormously increased. Chip and surface friction is reduced. Cleaner threads result.

The *electrolizing* treatment penetrates the tap so that tap life *after* sharpening as well as *before* sharpening is prolonged.

Electrolized Taps are distinguished by a *red* square atop the shank

What About Cost?

Electrolized Taps cost more than ordinary taps but *cost per tapped hole* is lower. Not only do you get more holes per tap but greater production per machine and per operator due to decreased "down time".

How Can You Get The "Proof of the Pudding?"

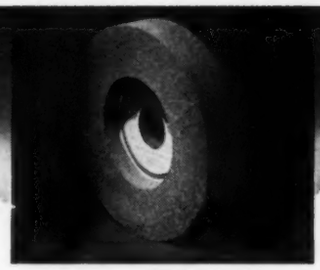
By asking your mill supply distributor to send you a trial lot of *Electrolized* Taps so that you may make a direct performance comparison with taps that have not been electrolized.

The increase in tap life is so great that you cannot afford to overlook this revolutionary advance in thread production and tap economy. For descriptive Bulletin, write

Electrolized TAP CORPORATION
148 WEST RIVER STREET
PROVIDENCE 1, RHODE ISLAND

RIGIDITY • • • SMOOTH POWER
• • • AND EASE OF CONTROL
Sidney has all three
You will find the three essentials to precision lathe production in Sidney Lathes.
RIGIDITY that stems from a four wall bed construction amply cross girted at frequent intervals. This design departs from conventional two wall construction and gives a better distribution of metal providing greater resistance to deflections and twisting strains.
SMOOTH POWER is assured through the continuous tooth herringbone geared headstock. This form of tooth provides more tooth contact resulting in greater strength, smoother action and elimination of end thrust through the opposed helix angle. In addition to conventional bearings both spindle and intermediate shaft are supported by center bearings.
EASY OF CONTROL is provided in centralization of all control levers. The control for both longitudinal and cross feed is through independent snap levers on the apron which actuate jaw clutches and is provided with an overload safety feature. An interlock prevents the use of the feed gearing when half nuts are engaged.
Thus Sidney Lathes give you rigidity that assures continued accuracy—smooth power to handle heavy cuts and maintain high finish—and ease of control that assures more work with less effort on the part of the operator.
Bulletins on all sizes available.
Builders of Precision Machinery
THE SIDNEY MACHINE TOOL COMPANY
SIDNEY • OHIO
SIDNEY
ESTABLISHED 1904

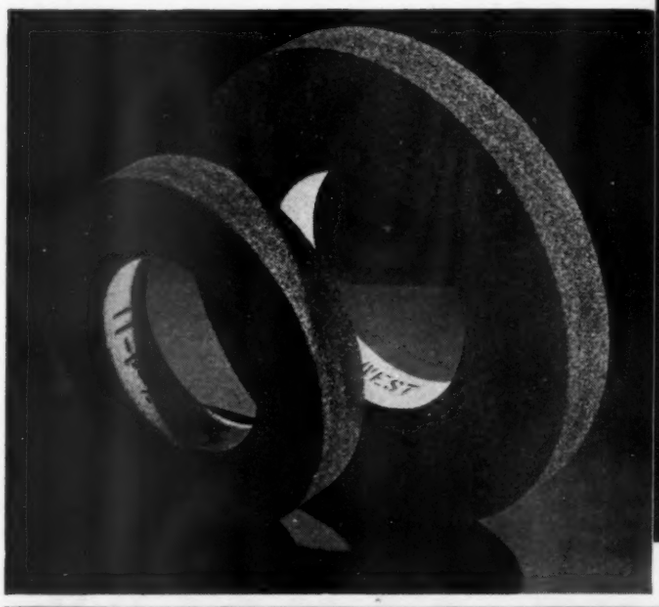
Proven QUALITY



Proven quality and dependability of performance are hallmarks of the products of the Mid-West Abrasive Company.

Mid-West's outstanding successful tool room grinding wheel, and every other product of the broad Mid-West line—honing stones, sharpening stones, coated abrasives, disks and wheel dressers—all must bear these two hallmarks.

Let engineered quality and dependability guide you in your choice of abrasives, and we feel certain that choice will be Mid-West. Prompt delivery on all items.



MID-WEST ABRASIVE CO.

Manufacturers of DEPENDABLE Abrasives

Owosso, Mich. • Detroit • Rochester, Pa.

HILL "Open Side" Hydraulic Vertical Spindle Grinder (Size 18" x 18" x 60")

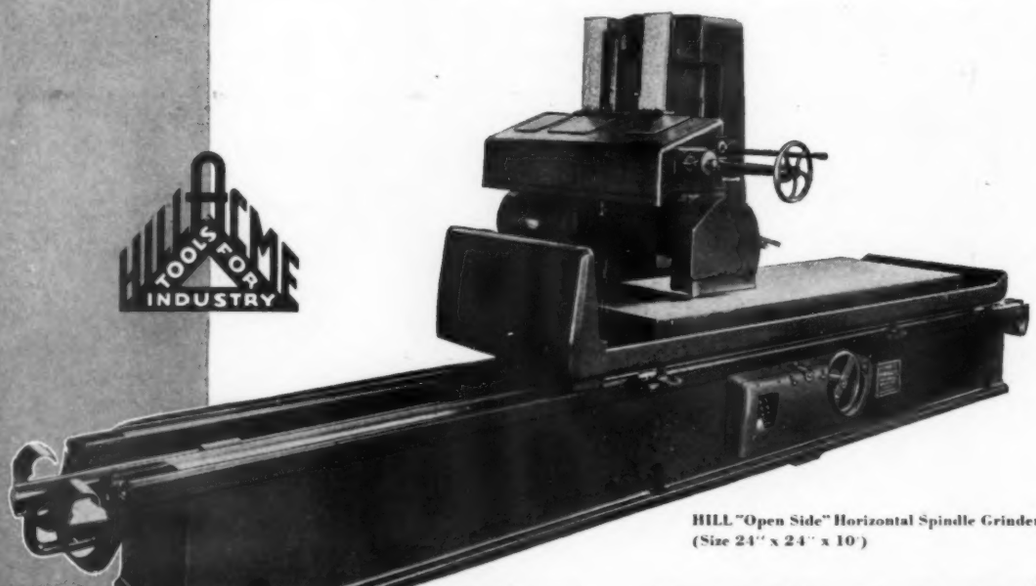
THE NECESSITY OF PRECISION!

The acquired habit of precision in war—*precision* bombing, *precision* navigation, *precision* timing, *precision* production—will carry on.

Industry will be satisfied with nothing less, and precision grinding will make your products as accurate in peace as they were in war.

The advantage of increased production with lowered cost is assured through precision when surfaces are finished on a HILL "Open Side" Hydraulic Surface Grinder.

Made in both Horizontal Spindle and Vertical Spindle design, there is a size to meet every requirement of heavy duty precision grinding.



HILL "Open Side" Horizontal Spindle Grinder (Size 24" x 24" x 10')

HILL ACME TOOLS FOR INDUSTRY

THE HILL ACME COMPANY

6400 BREAKWATER AVENUE • CLEVELAND 2, OHIO

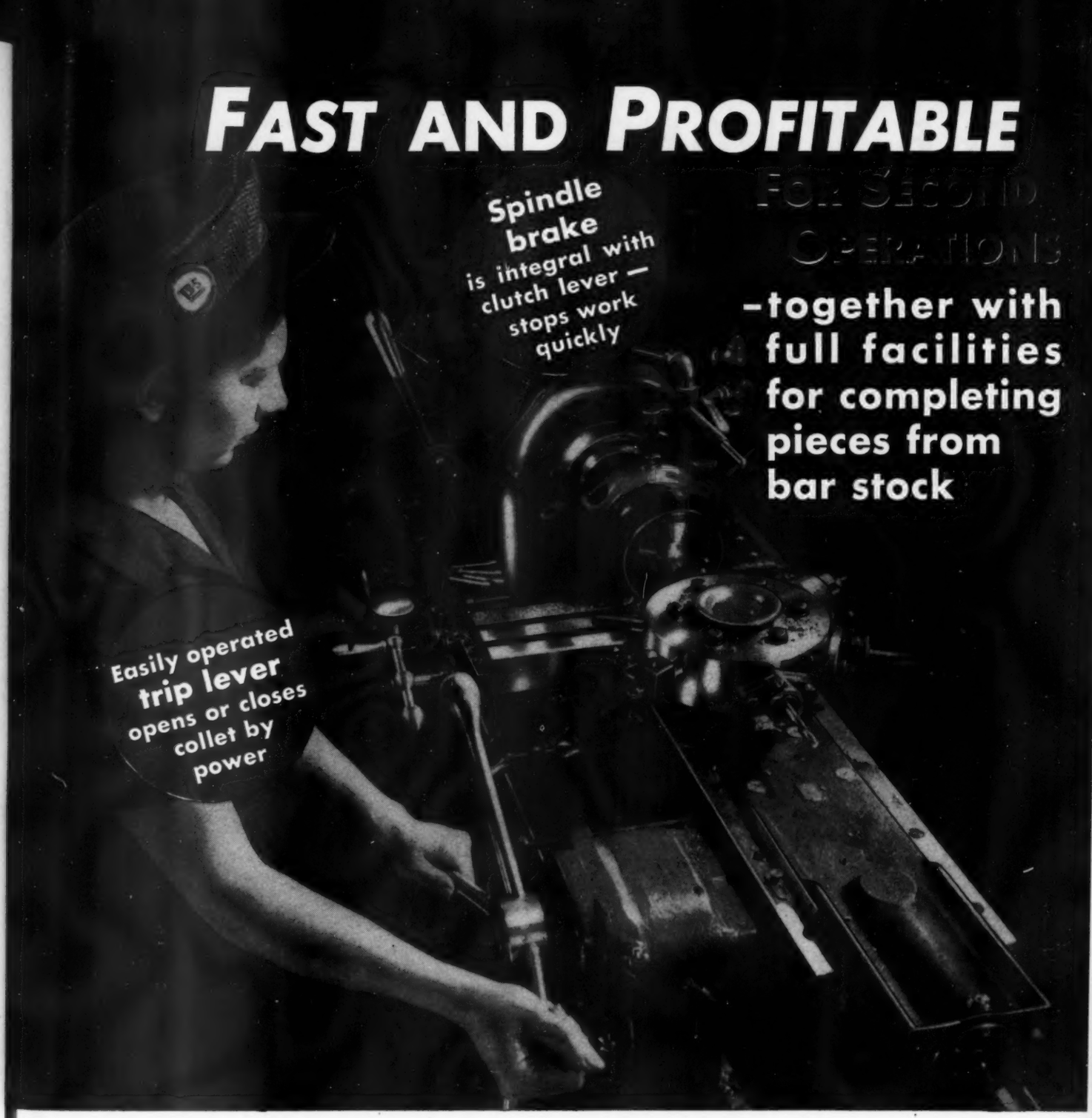
"HILL" HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING • THREADING • TAPPING MACHINES
"CANTON" ALLIGATOR SHEARS AND PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES AND SHEAR BLADES

FAST AND PROFITABLE

FOR SECOND OPERATIONS

Spindle brake is integral with clutch lever — stops work quickly

–together with full facilities for completing pieces from bar stock



Easily operated **trip lever** opens or closes collet by power

Rapid Operation with Minimum Effort on **Nos 1** and **2 WIRE FEED SCREW MACHINES**

One lever controls spindle — forward, backward and brake

Cross slide has lever feed for quick action. No. 2 Machine also has screw feed

20 spindle speeds — efficient high speeds in proper relation to slow threading speeds

Adjustable stop for each turret tool

Ask for booklet showing why these versatile machines are Accurate, Efficient and Fast.

B·S BROWN & SHARPE MFG. CO.
Providence 1, R. I., U. S. A.

BROWN & SHARPE

THE TOUGHER THE SERVICE THE BETTER THE TEST...

Many small tools are capable of handling easy jobs with a certain degree of efficiency and economy, whereas on the tough job they might not stand the gaff.

Today, most jobs are tough, calling for tough tools. Then too, because of small tool shortage, all tools must sooner or later be assigned to gruelling service making it imperative that every small tool be capable of maximum performance in long, hard work.

The test of UNION TOOLS is to put them to work under today's conditions and let results dictate the tools you buy. On such a basis UNION will be the "Tools You Buy Again."

THE UNION LINE

Twist Drills—Milling Cutters—Reamers—Hobs—Slitting Saws — End Mills — Taps — Dies — Screw Plates—Profile Cutters.

UNION TWIST DRILL COMPANY, ATHOL, MASS.

STORES New York Store: 61 Reade St.; Los Angeles Store: 524 East Fourth St.; Chicago Store: 11 So. Clinton St.; Seattle Store: 568 First Ave., So.; San Francisco Store: 121 Second St.; Detroit Store: 5527 Woodward Ave.

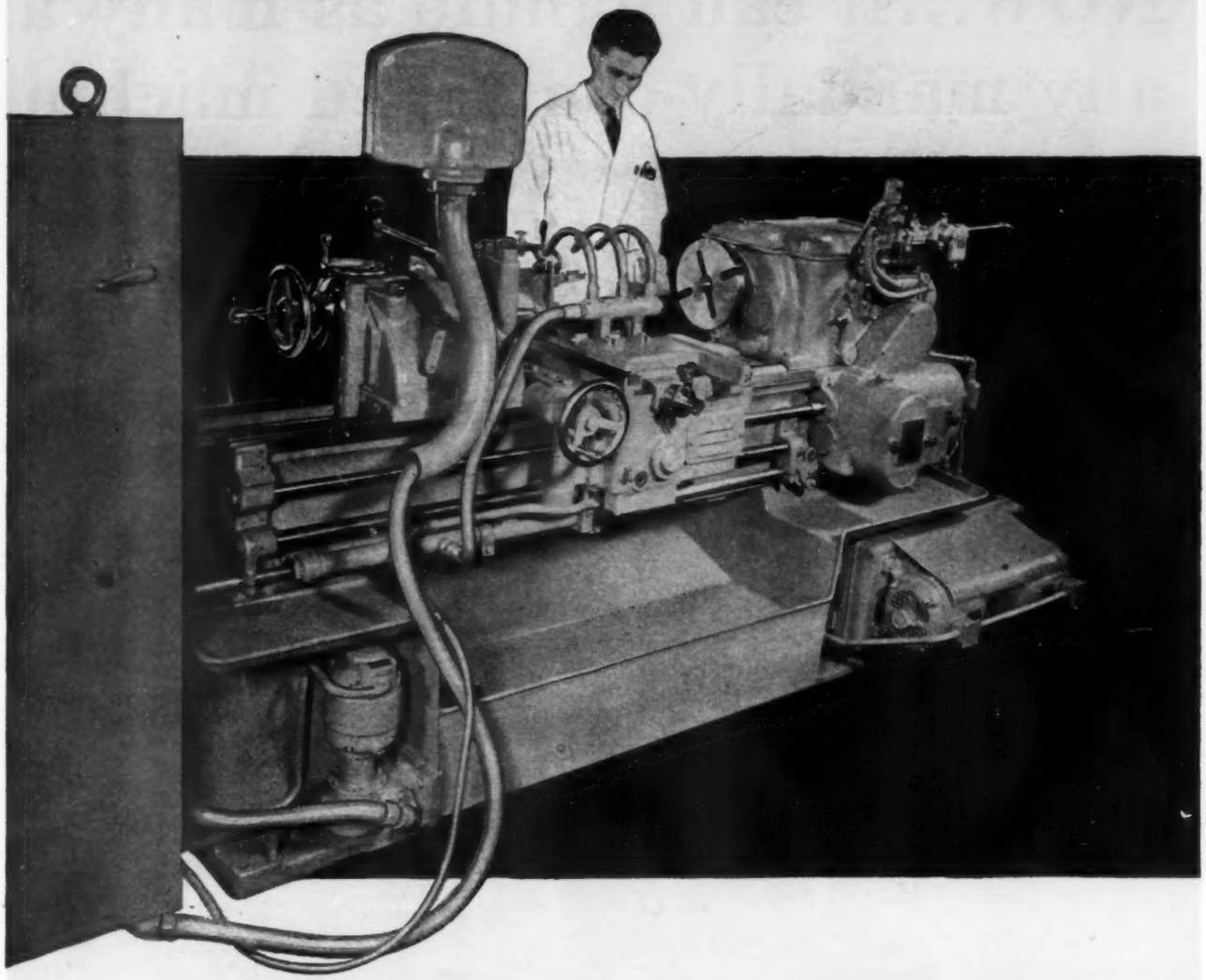
MANUFACTURING DIVISIONS

S. W. Card Mfg. Co., Div.; Mansfield, Mass
Butterfield Division, Derby Line, Vt., and Rock Island, Quebec

UNION

SAFE SHROUDING

for "Nerves" of Automatic Electrical Controls



Critical automatic controls require out-of-the-ordinary protection. Oil, dirt, grease or other "shop" interference with the electrical circuits would put production in hazard. Forward-looking designers of the Monarch Magna-Matic Automatic Lathe applied the modern solution in specifying Titeflex Flexible Conduit to protect electrical control lines.

Similarly, Titeflex takes over the service responsibility of keeping the coolant liquid lines pressure tight despite vibration.

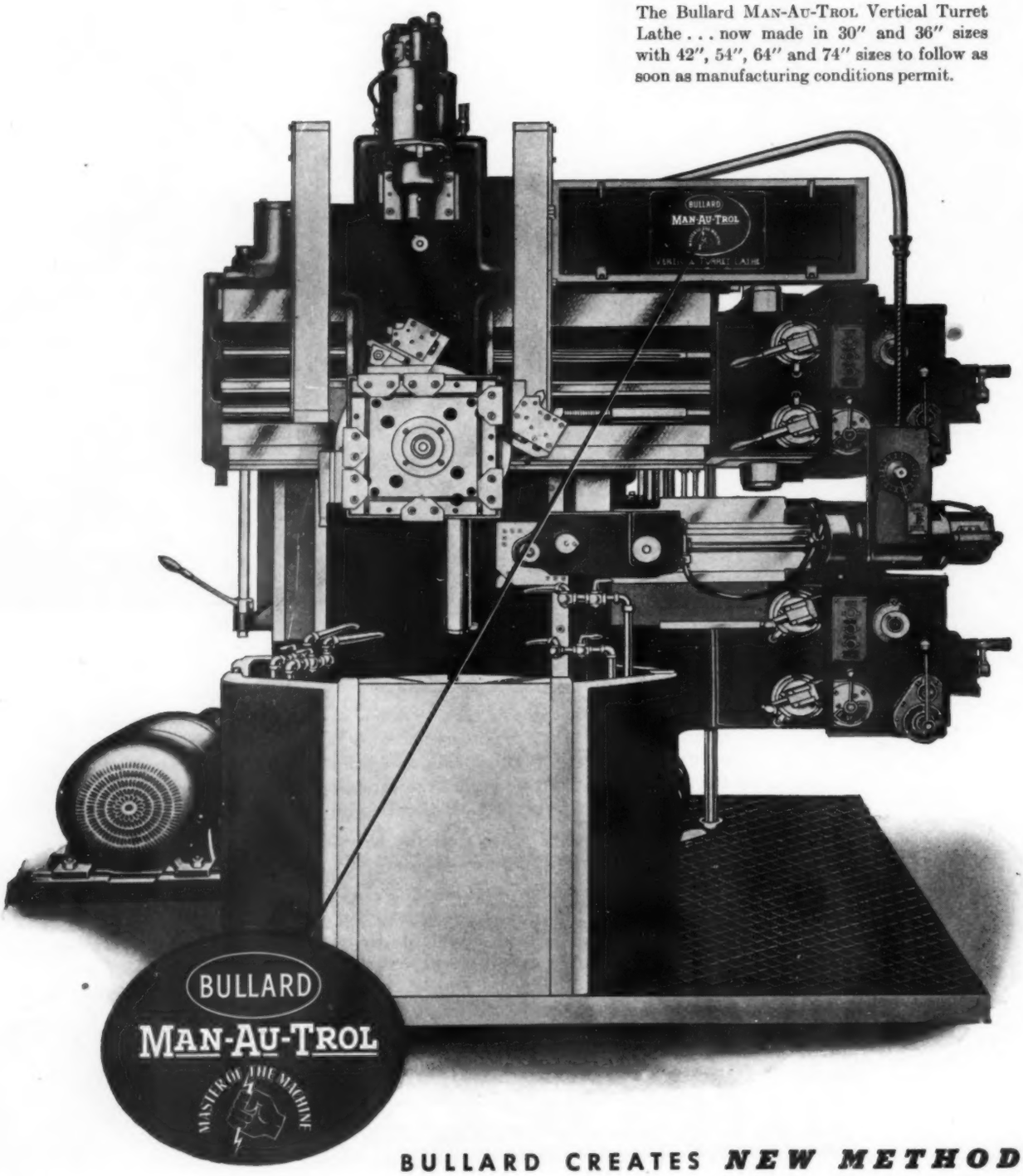
Your own product or machine may require the same trouble-free protection and service. If you are faced with the problem of flexible conduits or conveying of gas, oil, or liquids under conditions of constant vibration, high temperatures, or pressures — our application engineers can be of service to you. Call or write: Titeflex, Inc., 535 Frelinghuysen Ave., Newark, New Jersey.

Titeflex THE ALL-METAL FLEXIBLE TUBING THAT STAYS TIGHT

How many classes of work can <u>one</u> automatic machine handle?

NOW...it can handle as many as any manually-controlled machine

The Bullard MAN-AU-TROL Vertical Turret Lathe . . . now made in 30" and 36" sizes with 42", 54", 64" and 74" sizes to follow as soon as manufacturing conditions permit.

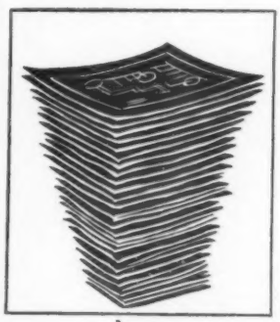


BULLARD CREATES *NEW METHODS*

The reason is...

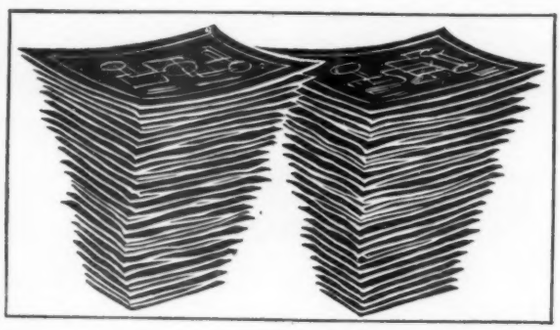
BULLARD MAN-AU-TROL

The automatic control that is as versatile as manual control



Classes of Work Performed by Manually-Operated Machine

Classes of Work Performed by Usual Automatic Machine



Manually-Operated MAN-AU-TROL-*Operated*

Classes of Work Performed by Machine Equipped with MAN-AU-TROL

The proof is...

BULLARD MAN-AU-TROL

Vertical Turret Lathe

No longer must an automatic machine be essentially a special-purpose machine

The Bullard MAN-AU-TROL principle of automaticity makes a manually-operated machine *100% automatic* . . . gives it all the production advantages such a revolutionary transformation implies . . . without affecting its multi-purpose nature.

In fact, the nature of that machine acquires a broader versatility. Everything it *can do* as a manually-controlled machine, it can still do under *either* manual or automatic control.

The production-increasing, cost-lowering possibilities of such a unique manually-*or* automatically-controlled machine are worth investigating. Its *quick, easy adaptability* to one-piece, small-lot or long-run jobs will help you take diversified schedules and changing specifications in stride . . . will give you cost and delivery advantages in competitive markets.

At present, MAN-AU-TROL is being built into Bullard machines only.

The Bullard Man-Au-Trol Vertical Turret Lathe gives you the following advantages:

1. *Lightens Labor's Load* because the operator machines the first piece under manual control while easily setting the best production method into an automatic cycle . . . then merely loads, supervises and unloads when MAN-AU-TROL's 100% automaticity takes over.

2. *Makes One Machine Do More* because it automatically machines any class of work within manual-control range . . . is instantly convertible to manual operation on the same or a different piece without affecting the automatic cycle.

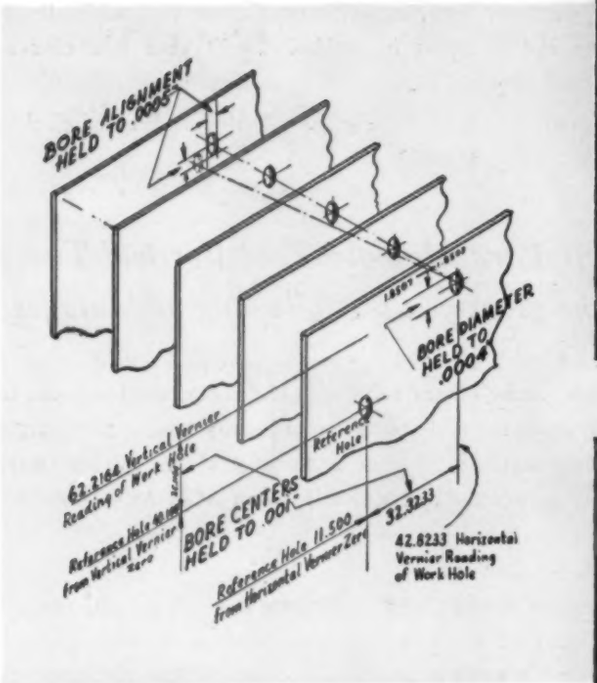
3. *Cuts Automatic Set-up Time* because set-up time from one class of work to another is only slightly more than for a manually-operated machine.

4. *Reduces Spoilage* because it operates continuously to a degree of accuracy no manual operator can duplicate.

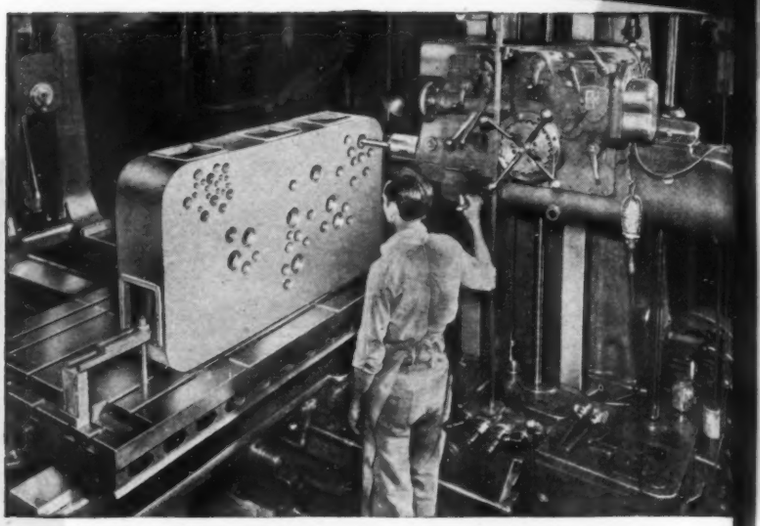
Many other advantages of the Bullard MAN-AU-TROL Vertical Lathe are covered in Bulletin MAV-G-1. Write for your copy today. The Bullard Company, Bridgeport 2, Connecticut.

TO MAKE MACHINES DO MORE

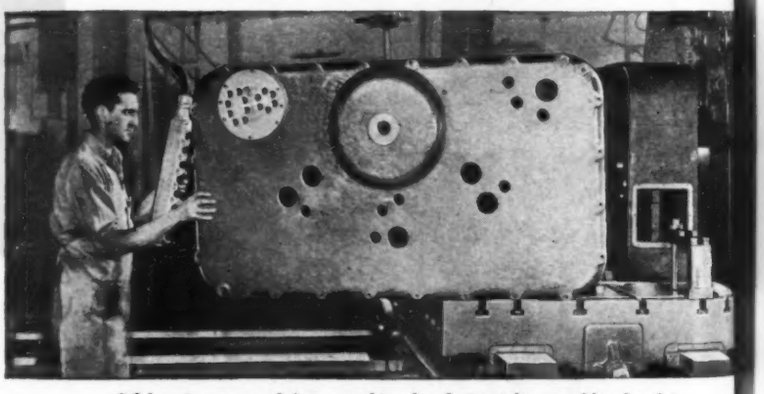
G. & L. HOLDS BORE


BORE ALIGNMENT HELD TO .0005"
BORE DIAMETER HELD TO .0004"
62.2164 Vertical Vernier Reading of Work Hole
Reference Hole from Vertical Vernier Zero
BORE CENTERS HELD TO .001"
Reference Hole from Horizontal Vernier Zero
32.3233
42.8233 Horizontal Vernier Reading of Work Hole

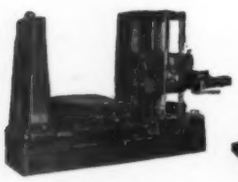
Sketch showing accuracy maintained in three ways. (1) Bore centers to .001"; (2) bore diameters to .0004"; (3) bore alignment to .0005".



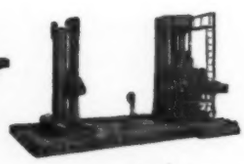
Holes are drilled, rough bored, counterbored and finished to precision limits in a single setting on this 28 spindle machine tool head.



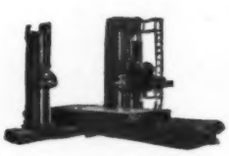
Oil housing removed from machine head. At right on table—head in machining position showing center plate bolted in position.



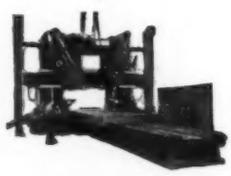
G. & L. Table Type Machine



G. & L. Floor Type Machine



G. & L. Planer Type Machine



G. & L. Multiple Head Type Machine

GIDDINGS & LEWIS MACHINE TOOL CO.

Center Distances to .001"
Alignments to .0005"
Diameters to .0004"

Giddings & Lewis Horizontal Boring Machine Drills, Bores, Counterbores and Finishes 5 Assembled Plates with *Jig Borer* Accuracy...Machine Scales and Verniers Locate All Holes

Finish dimensions and limits equivalent to those obtained on jig boring equipment are achieved in a single setup on a Giddings & Lewis Horizontal Boring Machine. When this degree of accuracy is required, it is the usual practice to rough out holes on a different machine prior to final machining on a jig borer. This machine head shows how finish dimensions were obtained on a table type G. & L.

Standard machine scales and verniers locate all holes following simple arithmetical calculations. A reference hole is established in the workpiece and all measurements are made from that point. By simple addition, the operator quickly and easily arrives at the correct vernier reading for any line of holes.

TYPICAL VERNIER CALCULATIONS

Horizontal vernier reading at reference hole	11.500"	Vertical vernier reading at reference hole	40.100"
Drawing dimension indicating horizontal distance from reference hole to work hole	32.3233"	Drawing dimension indicating vertical distance from reference hole to work hole	25.1164"
Correct horizontal vernier reading at work hole	43.8233"	Correct vertical vernier reading at work hole	65.2164"

LESS MACHINING TIME REQUIRED

Overall production time is materially reduced on precision machining operations of this kind. Routing of the work over several machines for individual operations is not required. It is both possible and practical to complete all rough and finish cuts on the G. & L. Horizontal Boring Machine. Giddings & Lewis engineers are available to tell you how you can save time and simplify drilling and boring operations on your own work by utilizing the versatile features of Giddings & Lewis Horizontal Boring, Drilling and Milling Machines.

Free...

Helpful Production Facts and Data applicable to standard and special machining problems. Write today for actual field stories interestingly presented in G. & L. Production Data Folder A.M. 36.

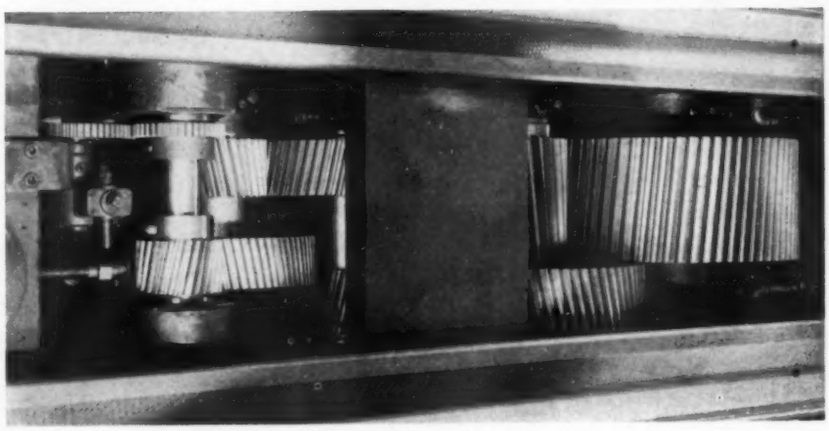
138 Doty Street • Fond du Lac, Wis.

GRAY Advantages

GRAY BALANCED HELICAL GEAR DRIVE

counteracts the 'side-thrust' of the cutting tools

. . . and it is the only planer drive that does. Unless the side thrust of the cutting tools is counter-balanced you will get unequal wear on your vees. Examine your Gray Planers; if there is any wear at all, even after years of use, you will find it is equal on both faces of the vees.



This is one advantage of the Gray Balanced Helical Gear Drive in which the wide faced helical bull gear balances the side thrust of the cutting tools. Another advantage is the universally recognized enduring smoothness of motion of helical gears. For complete information about Gray advantages, write for bulletin 40-R-3.

DOUBLE HOUSING and OPENSIDE PLANERS
•
SWITCH PLANERS
•
DIE BLOCK PLANERS
•
MILLING PLANERS
•
PLANER TYPE MILLING MACHINES
•
HORIZONTAL BORING MACHINES

The G.A. GRAY Co.

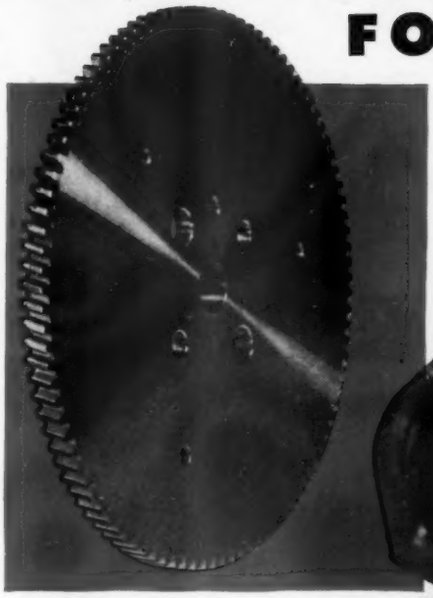
CINCINNATI 7, OHIO, U. S. A.

UPTON BRADEEN & JAMES, LTD—CANADA • **MACHINE AFFILIATES — SOUTH AMERICA**

BARBER-COLMAN

HOBS • HOBBING MACHINES • HOB SHARPENING MACHINES • MILLING CUTTERS
REAMERS • REAMER SHARPENING MACHINES • SPECIAL TOOLS

FOR ACCURACY IN GEAR CUTTING



NO. 3 HOBBING MACHINE

HOLDS CLOSE LIMITS ON BRONZE WORM WHEEL

Barber-Colman Hobbing Machines are designed and built to meet exacting standards of gear manufacture. Greater quietness, efficiency and durability in gear drives is often obtained by specifying greater accuracy and finer finish on the hobbed teeth. Barber-Colman machines are prepared to meet such demands — as exemplified by the bronze gear shown here, which is held to a concentricity of .0005", excellent finish, .0002" runout when rolled with a master gear, and zero backlash. *Barber-Colman Hobbing Machines produce precision gears on the production line.*

JOB FACTS

THE GEAR. Bronze casting, 160 Brinell. 99 teeth, 24 pitch, 15° 44′ helix angle. Outside diameter 4.363″, face 3/16″. Accuracy requirements specified above.

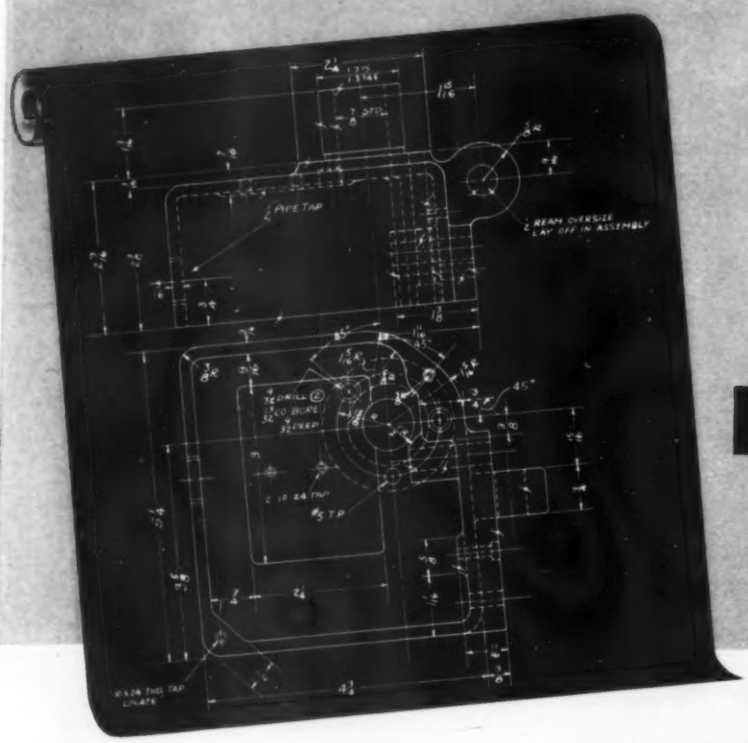
MACHINE SET-UP. Special collet and steadying fixture.

Feed .02437″ per rev. of work, speed 133 r.p.m. Cutting time 17 minutes. 140 pieces per hob sharpening.

BARBER-COLMAN COMPANY

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U.S.A.



DRILLS BORES REAMS TAPS

holes up to 1¼"

FOSDICK HIGH SPEED DRILL

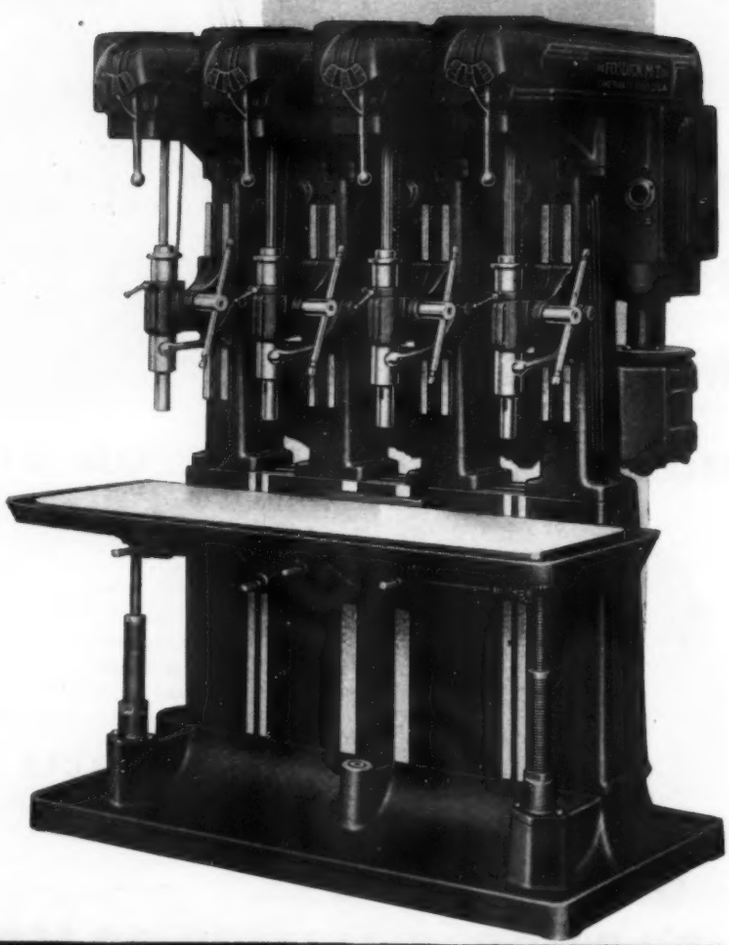
● The above print illustrates a typical job for a Fosdick High Speed Drill arranged for tapping. On this job drilling, reaming, counterboring and tapping operations are being performed on various hole sizes.

In actual practice the work was jigged and the various operations were performed in sequence on top and two sides. However, for high production the job could be handled on a four spindle machine faster and at lower cost providing the desired quantity was large enough to warrant expenditure for the additional equipment.

These machines are available in single spindle types, with or without tapping spindles, and most any combination of spindles from one to six with various base assemblies to meet job requirements.

On your drilling, reaming, boring, tapping and similar operations put your work on a Fosdick High Speed Drill for accuracy, speed and low cost production.

Write for High Speed Drill Bulletin H. S. A. for complete information.



FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

Producing Trailer Axles

FROM 2 INCH BAR STOCK TO CLOSE TOLERANCES AT THE RATE OF 8 MIN. PER OPERATION ON THE BARDONS & OLIVER NO. 5 UNIVERSAL TURRET LATHE

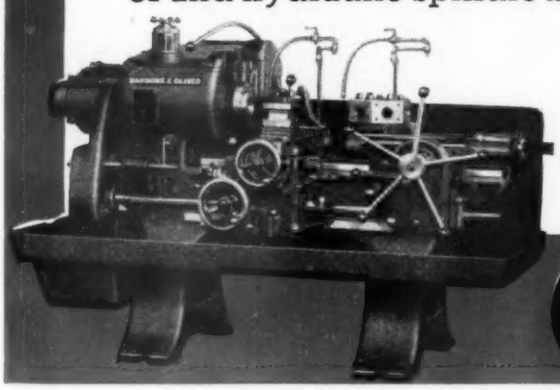
... is an easy job at Patton Co., Cleveland, Ohio.

Standard turret tools are used very effectively.

The hydraulic speed pre-selector and hydraulic spindle brake reduce time between cuts and save the operator's strength.

Hardened alloy steel bedways and wear strips on both slide and saddle preserve the inbuilt accuracy of the machine.

Many outstanding features make this machine excel on both bar and chucking work.



WRITE FOR CIRCULAR

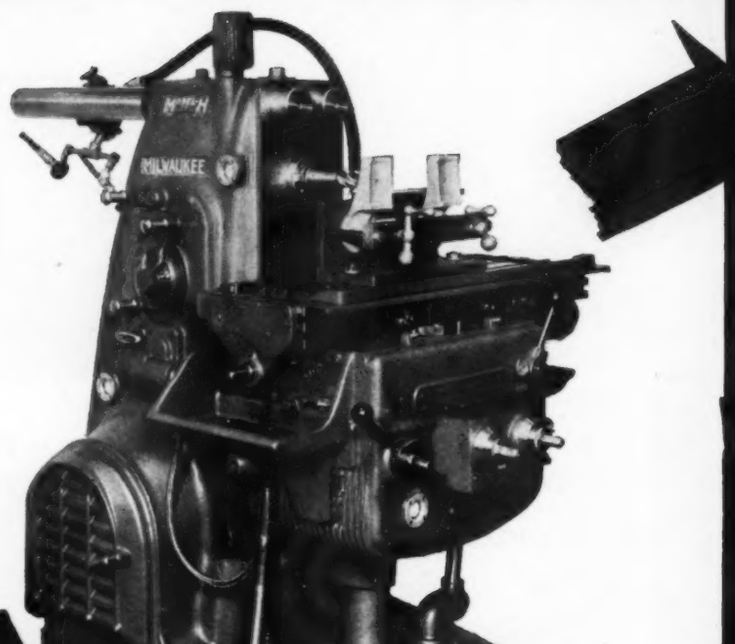
BARDONS & OLIVER, INC.

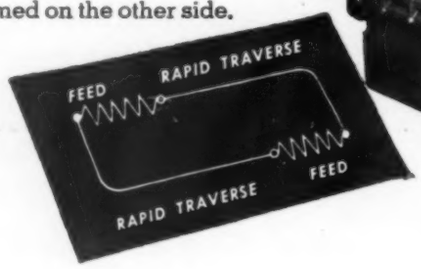
1133 WEST 9TH STREET • CLEVELAND 13, OHIO

★ FAST WORK ON A

LOW-COST PRODUCTION MILLING OF A WIDE RANGE OF SMALL OR MEDIUM SIZE WORK PIECES

In this operation on a Kearney & Trecker Milwaukee 1H-12" Manufacturing Milling Machine a boss is being milled on the back of a table saddle. A two-station hand clamping fixture is mounted on the table. Continuous table movement in a two-way cutting cycle is governed by the automatic hydraulic control system. The holding fixture is simple and efficient, providing for easy and fast loading as well as unloading and loading on one side of the fixture while the milling operation is performed on the other side.





In the two-way cycle (see diagram) shown above, the table moves at a rapid traverse rate of 150 inches per minute between cuts where the feed rate is 3.5 inches per minute. These cycles are regulated by the machine's automatic hydraulic control system. The cycle can be interrupted by the operator's hand control at any point in the cycle.

KEARNEY & TRECKER

Ease of operation, accuracy, speed and low-cost-per-piece production are the advantages that make No. 1H 12" and 18" Manufacturing Type Milling Machines so efficient for light milling operations. Extremely versatile, either manually or automatically controlled, they are readily adapted to long or short runs and capable of a diversity of milling operations on light and small or medium sized pieces.

Fast, low-cost production and exceptional ease of operation are achieved through these Milwaukee design features: *complete automatic hydraulic controls for one or two-way cutting cycles; climb cutting screw and adjustable nut for climb milling operations; automatic spindle stop and reverse rate selectors.*

Write for complete information on the 1-H Series and the entire Kearney & Trecker line of more than 70 models of milling machines.

KEARNEY & TRECKER CORPORATION
MILWAUKEE 14, WISCONSIN

ALL OF THEM...

KNURLED FOR YOUR CONVENIENCE!

UNBRAKO

Reg. U. S. Pat. Off.

Your fingers never slip when you work with a compass, no matter how much your hands have perspired—because of the knurled top. The knurled stem of a watch makes winding it a simple matter . . . bottle caps screw on easier when they are knurled. Micrometers, radio dialing-knobs . . . all are knurled for every-day convenience.

We applied this same principle when we knurled the heads of our "Unbrako" Socket Head Cap Screws. The knurls provide a slip-proof grip, even for oily fingers . . . and the knurled "Unbrako" can therefore be screwed-in farther and faster, before using a wrench.

Knurling is added help in the "Unbrako" Socket Set Screw with knurled points. It's a *Self-Locker*, because the knurled points dig-in and hold firm against even the most stubborn vibration. Yet, this screw can easily be backed-out with a wrench and used again and again.

Pat'd and Pats. Pending

Both screws in sizes from #4 to 1½" in diameter; full range of lengths. Write for the "Unbrako" Catalog of Socket Screw Products.

"UNBRAKO" and "HALLOWELL" products are sold entirely through distributors.

OVER 44 YEARS IN BLUSINESS

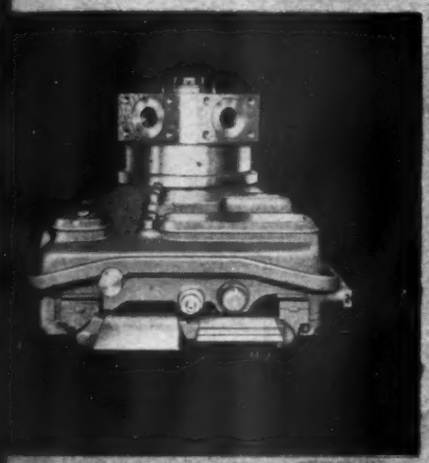
STANDARD PRESSED STEEL CO.

JENKINTOWN, PA. BOX 4

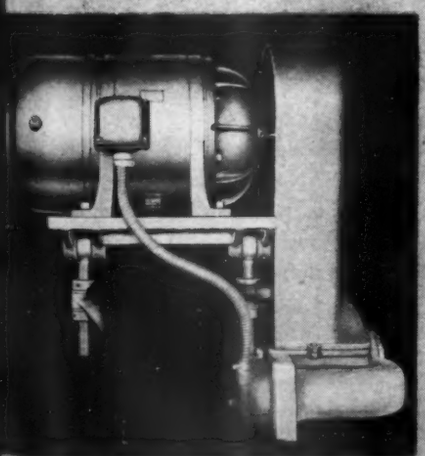
Knurling of Socket Screws originated with "Unbrako" years ago.

BRANCHES: BOSTON • CHICAGO • DETROIT • INDIANAPOLIS • ST. LOUIS • SAN FRANCISCO

...oss Slide Unit and base are of modern design. The ...ss slide cam drum is located under the cross slide ...d the ball bearing cam roll studs are mounted in the ...ss slide, thus furnishing a direct connection. The ...m drum is carried in a compartment at the rear, ...tside baseways and is readily accessible for appli...tion of special cams.



...rret Slide and Unit are of liberal proportions. Tur... Slide is provided with hardened and ground steel ...serts to form its bearings on base ways, which are ...o of hardened and ground steel. Turret is automati...lly clamped in position after indexing. Five turret ...ces are provided for mounting of tools.

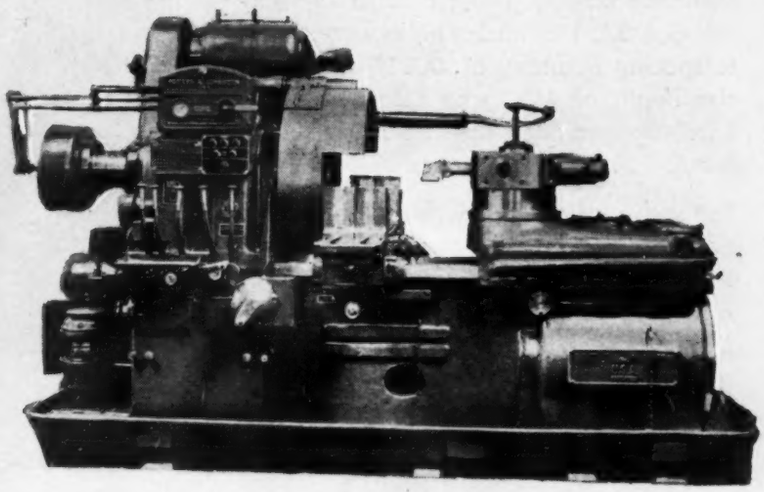


...otor Drive is provided through a special multiple ...belt. A constant speed motor is mounted at rear of ...adstock and is equipped with a constant speed driv... pulley. Another constant speed motor for driving ...t motion mechanism is provided and is reversible ... setting-up purposes.

P & J

6-D REL & RELX

AUTOMATICS



. . . with time-proved features that cut production costs

These P&J Automatic Chucking and Turning Machines . . . the product of more than forty years specialized experience . . . can be depended on to put the production of large duplicate parts in quantity on a low cost, profitable basis. The features described here are typical of P&J leadership in the design and construction of automatic chucking equipment.

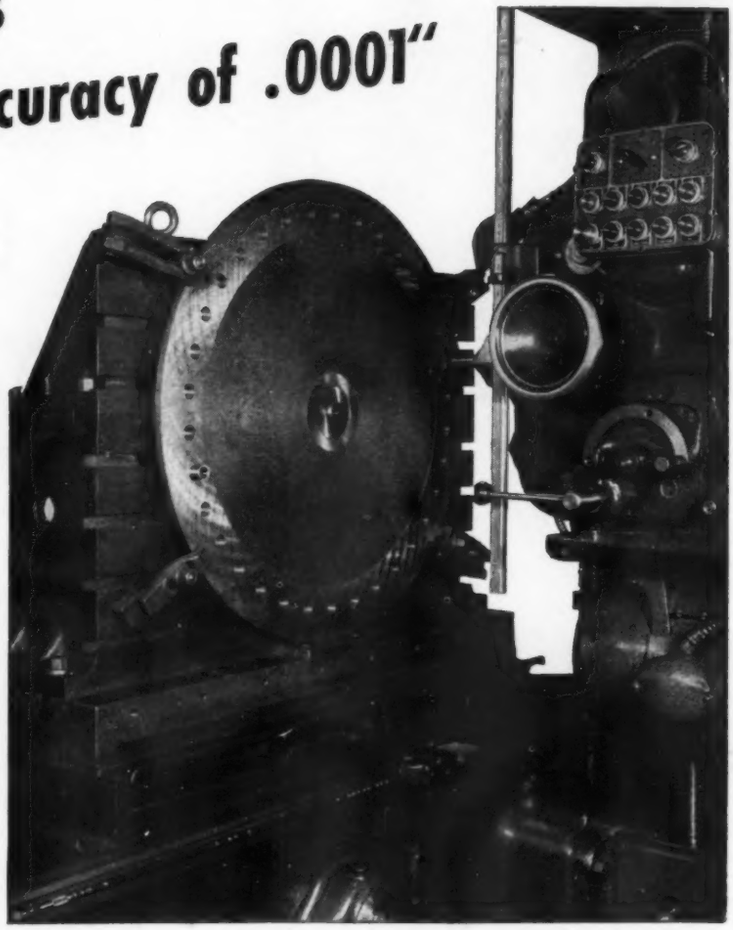
Ask for Bulletin 118 giving further details on the 6DREL P&J Automatics. Call on P&J engineers for advice and assistance on your problem of duplicate parts production.

POTTER & JOHNSTON MACHINE CO.

PAWTUCKET, R. I.

Make an Extra Effort and Buy Those Extra Victory Bonds Now!

34 Index Holes Bored to Spacing Accuracy of .0001" in 10½ Hours!



Here's a typical report on the actual results obtained by one manufacturer using the new Model 3-B DeVlieg JIGMIL on a precision boring operation . . .

Part machined was a large index plate . . . 35" in diameter, 1¾" thick . . . of Mehanite casting. Using a Carboloy boring tool, 34, 1¼" index holes were bored to spacing accuracy of .0001" and shoulder depth of 1½" was held to .0002"! Total floor-to-floor time . . . . including set-up . . . was 10½ hours!

For such outstanding performance, speed and precision on your own boring operations, investigate the unusual accuracy and high productivity of the Model 3-B DeVlieg JIGMIL today!

The world's finest Boring and Milling machine!

Write today for complete descriptive folder.

One job well done deserves another

Create More Jobs Faster with a De Vlieg JIGMIL

Here's why users report two to three times the output with greatly increased accuracy as compared to other methods of boring and milling . . .

Centralized push button controls provide fool-proof precision for all functions of the machine. Automatic positioning of spindle from one location to another is controlled to within less than .0001" . . . and feather-touch, pressure controlled slide locks positively assure dependable locking uniformity after positioning.

DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

RED RING MACHINES

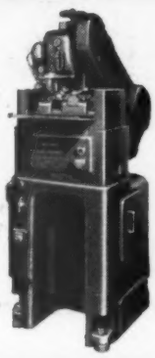
SHAVE GEARS UP TO 220" P. D.

If it's a spur or helical gear of any size up to 220" P. D. there is a Red Ring Machine on which it can be shaved.

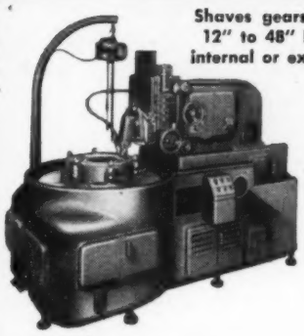
Gears up to 36" P. D. may also be shaved to the Elliptoid tooth form on Red Ring Rotary Shaving Machines.

Shaves gears from 1" to 24" P. D.

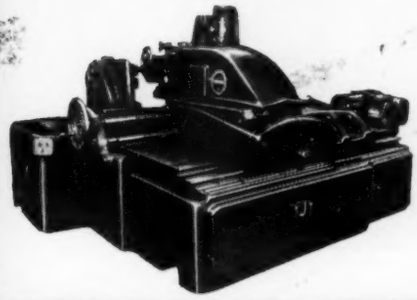
Shaves gears from 3/16" to 4" P. D.



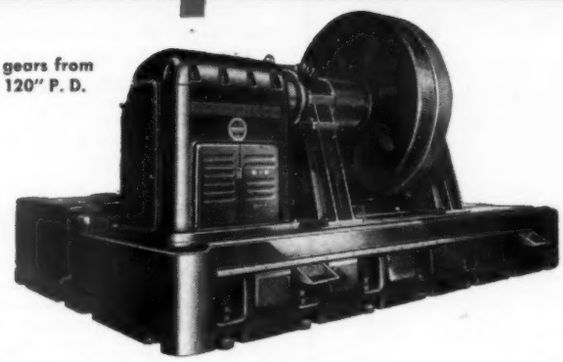
Shaves gears from 12" to 48" P. D., internal or external.

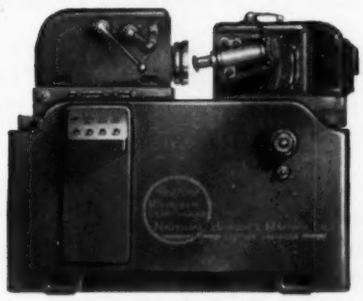


Shaves gears from 4" to 48" P. D.



Shaves gears from 24" to 120" P. D.





Shaves internal gears from 3" to 12" P. D.

NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN — RED RING ◯ PRODUCTS — DETROIT 13, MICH.

SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE

ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

HERE'S HOW G-E NONMETALLIC GEARS MADE INCREASED PRODUCTION POSSIBLE IN ONE PLANT

The 72-inch vertical boring mill pictured here was rebuilt for carbide turning to speed up production. The original 15-horsepower motor was replaced by one of 25 horsepower in order to get greater speeds.

When metal gears were tried on this stepped up model, the noise was unbearable—and it wasn't until G-E Fabroil nonmetallic gears were installed that the modernization job was complete. They transmitted the 25 horsepower smoothly and silently—speeding production and eliminating fatiguing gear noise.

If you are planning to rebuild your old machinery or have a noise problem in your shop, G-E nonmetallic gears should be thoroughly investigated.

For further information, contact your gear cutter. For the bulletin, "Silent Gears," write to Section Y-2, General Electric Company, Plastics Divisions, One Plastics Ave., Pittsfield, Mass.

TWO TYPES OF G-E NONMETALLIC GEARS ARE AVAILABLE FOR A WIDE VARIETY OF APPLICATIONS

G-E FABROIL for heavy-duty applications consist of compressed cotton fibers held together by steel shrouds and threaded studs.

G-E TEXTOLITE for lighter jobs consist of woven fabric held in compression in a phenolic resin.

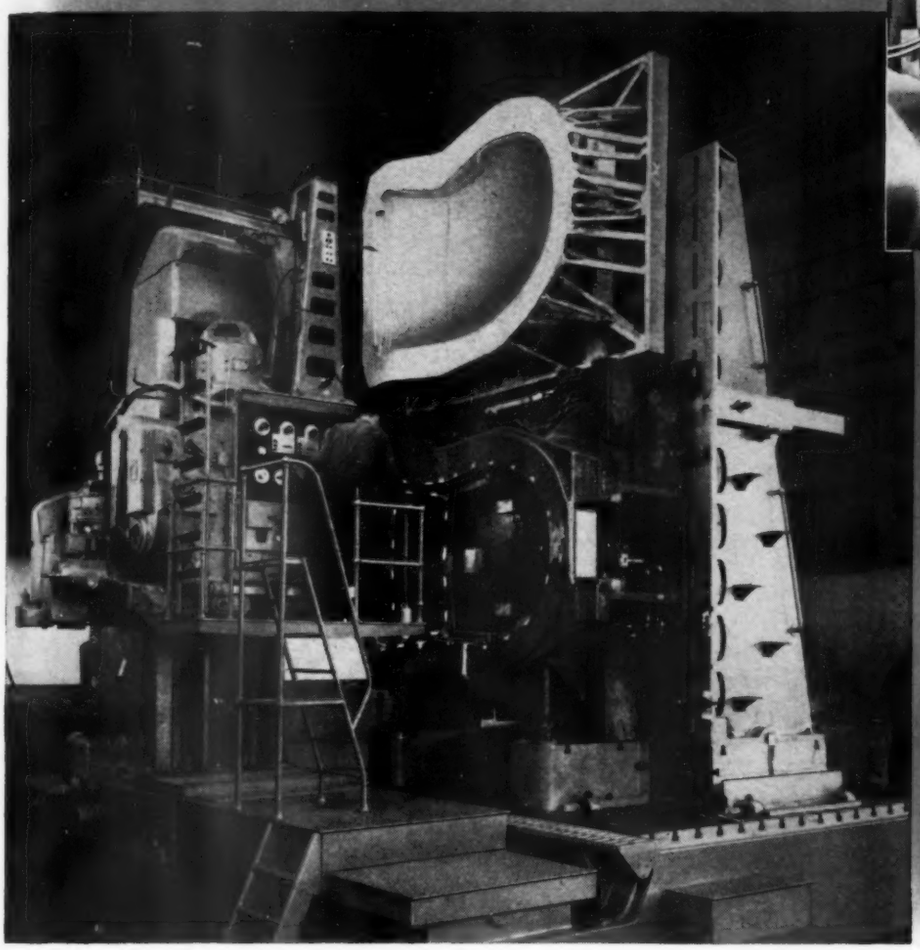
The photo and the story of the vertical boring mill featured in this advertisement were furnished through the courtesy of the E. D. Jones Company, Pittsfield, Mass., manufacturers of paper making machinery.

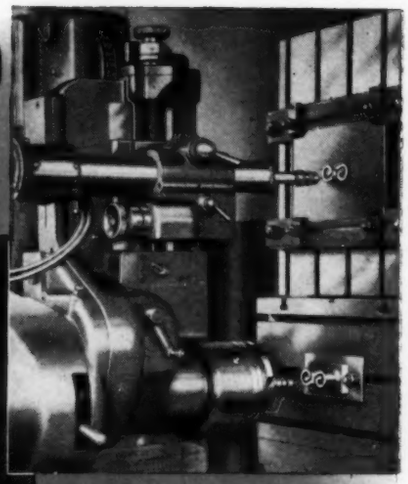
GENERAL ELECTRIC

CD-46-F2

EVERYTHING IN Plastics

KELLER TRACER-CONTROLLED MILLING





(Above) A Keller GG Machine produces the punch for a small electrical contact spring.

(Left) The Keller BG-3 Machine produces the three-dimensional die for a large auto body part.

Makes Dies and Molds of all Types and Sizes

A small part? Say a little electrical contact spring? The Keller Machine will make both the punch and die to mass produce it, from a model made from wood, plaster or other easily workable pattern material, or from one of the parts themselves.

A big part? Say a section of an automobile body? The sensitive electrically-controlled tracer will feel out the most intricate design in the model and duplicate it in a die, a mold or even a pilot model milled from steel, Duralumin or similar metal.

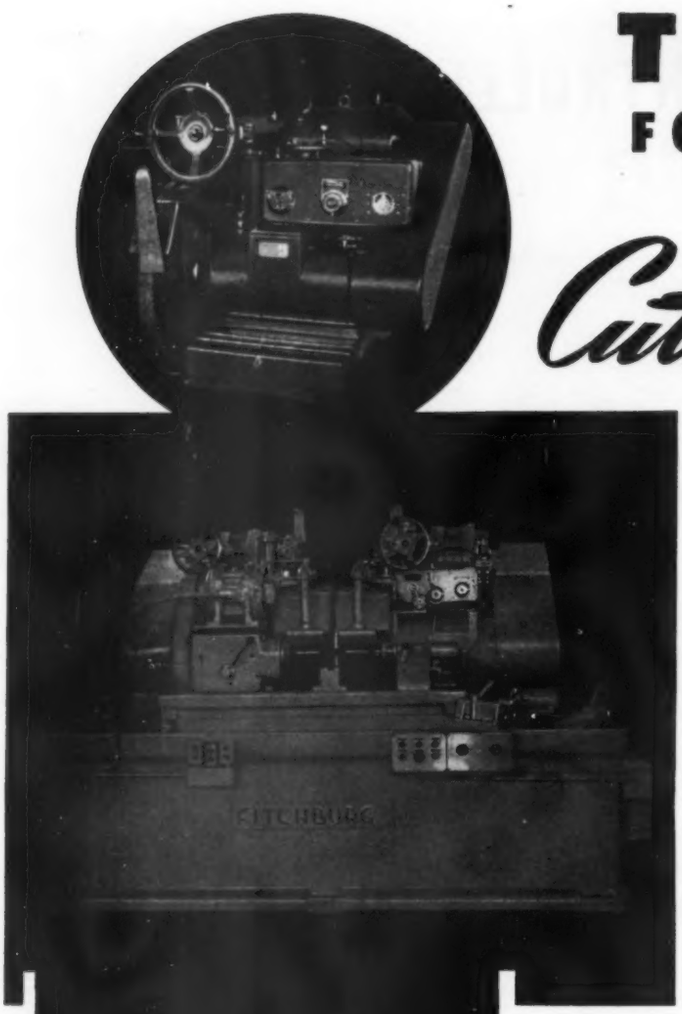
Yes, and the Keller Machine will produce dies and molds between those two extremes . . . any two- or three-dimensional shape up to $2\frac{1}{2}$ x 6 x 12 feet.

Reduce tooling costs. Cut experimental costs. Use the Keller process of tracer-controlled milling. There are several machines to cover the range of your requirements. Write today for full information.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT



THIS HEAD FOR MULTIPLE PRECISION GRINDING *Cuts* PRODUCTION COSTS

Mass production can be applied to precision grinding only with equipment whose design incorporates simple, automatic precision controls. The Fitchburg method works on a new principle, far superior to other methods.

"Brain center" of multiple precision grinding, the Fitchburg Bowgage Head is a completely self-contained and independent grinding unit. It can be installed *singly* on standard equipment in any position and at any angle 0° to 90°, or in multiples to operate simultaneously or consecutively in mass production.

Fitchburg design gives greater accuracy, finer finish, speedier operation, at less cost per piece. See *how* Fitchburg Bowgage heads, standard and interchangeable, save your investment for the reconversion period. Write today for information on how its cut-cost features can be applied to the precision grinding jobs in your plant.

THE HEAD. *The Bowgage Head* is a completely independent precision grinding unit. It has rapid traverse, slow grinding feed, grinding dwell or spark out, and rapid return to starting position — all started by one push button. It is precise to .0002", minimizing spoilage. It can be removed and remounted for other work, if operations are changed.

THE BODY. *This Special Fitchburg Double-Head Machine* grinds track roller shafts for caterpillar-type tractors. Two grinding wheels plunge-cut the diameter, after which both wheels travel toward each other to grind the shoulder of the shaft — *all in one set-up — with standard Bowgage Heads.*

Write Today for Catalog—Sent Free Upon Request

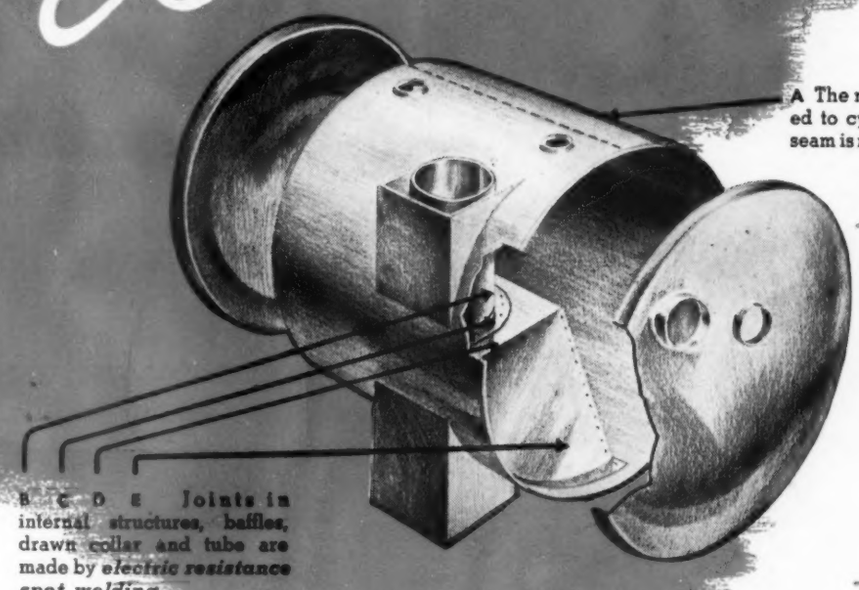
FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U. S. A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Both Full Universal Grinders and Special Purpose Grinders.

SPEAKING OF MAGNESIUM'S

Weldability



A The magnesium sheet is rolled to cylindrical form and the seam is made by ***torch welding.***

B C D E Joints in internal structures, baffles, drawn collar and tube are made by ***electric resistance spot welding.***

A TYPICAL AIRPLANE OIL TANK MADE OF MAZLO MAGNESIUM—Several joints (not shown) are made by ***helium arc welding.***

In magnesium, designers and production men have a wide selection of joining methods available to them. Spot welding is easily accomplished on standard aluminum welders. Torch welding has been done on a production basis for many years, with best results obtained by using oxy-acetylene gas and AMC-4 welding flux.

The development of helium arc welding for magnesium has greatly increased the designers' latitude with built-up sheet structures. This process, by eliminating the need for flux, permits the use of fillet, lap, edge and butt welds. Also, it cuts to a minimum the distortion and cracking frequently experienced in welded assemblies.

American Magnesium will gladly share its "welding" know-how gained through more than twenty-five years' experience in working with magnesium. For this assistance write:

Aluminum Company of America, Sales Agent for Mazlo Magnesium Products, 1709 Gulf Building, Pittsburgh 19, Pennsylvania.

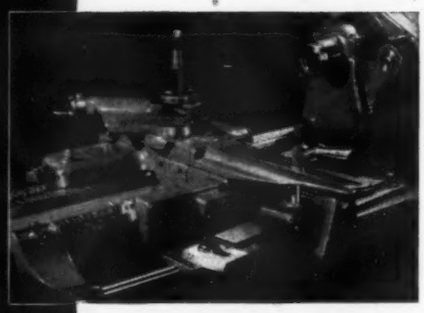
MAGNESIUM MAZLO PRODUCTS

AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

SOUTH BEND LATHES

For Accuracy
Versatility
Dependability



TELESCOPIC TAPER ATTACHMENT
For 10", 13", 14½", and 16" South Bend Lathes

This and other South Bend Lathe Attachments and Accessories permit quick tooling for a wide variety of precision machine work. Write for free Catalog 77. No obligation.

South Bend Lathes combine three distinguishing features which have won for them the acclaim of discriminating machine tool users everywhere:

» Accuracy that permits working to close tolerances and machining work with such smoothness that often one or more finishing operations can be eliminated.

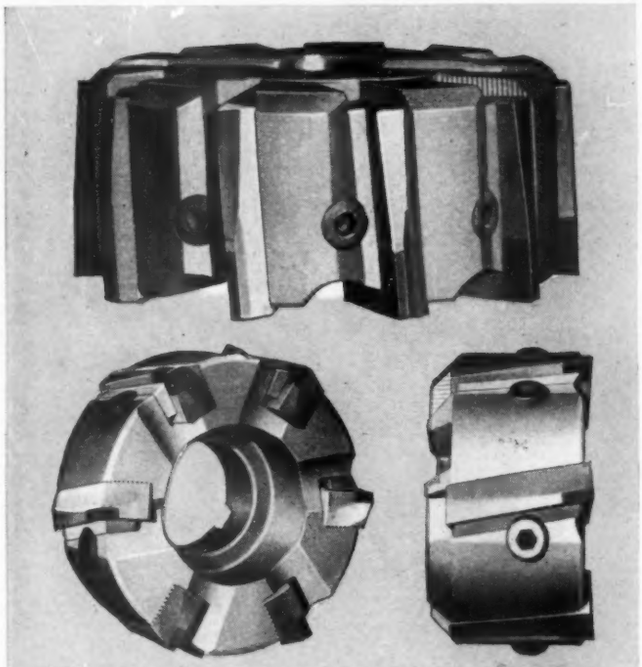
» Versatility to perform a wide variety of precision operations easily, quickly, and economically that otherwise would require installation of additional equipment.

» Dependability achieved through careful design and rugged construction assures day-in, day-out, trouble-free performance at low cost long after the installation has repaid its original cost.

Write today for Catalog 100-D which illustrates the entire line of South Bend Precision Lathes in full color and gives complete, detailed specifications of each model.

SOUTH BEND LATHE WORKS
419 EAST MADISON STREET • • SOUTH BEND 22, INDIANA
LATHE BUILDERS SINCE 1906

INGERSOLL CARBIDE CUTTERS *for Steel*

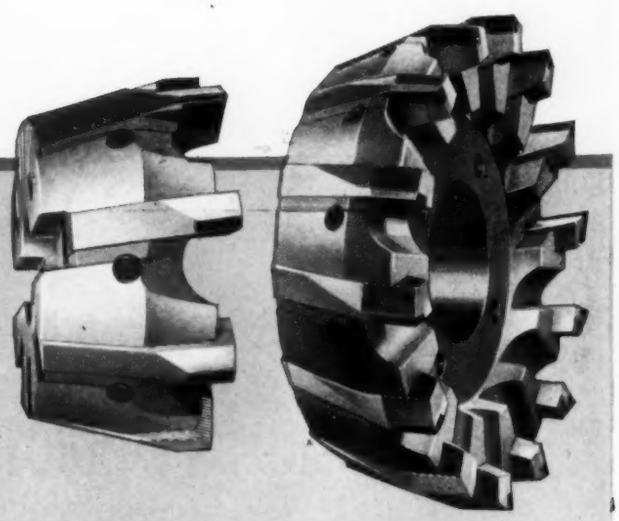


MEDIUM DUTY 3/16" STOCK

Cutter No.	Diameter	Teeth	Price
98104X	4	6	$ 46.00
98106X	6	8	52.00
98108X	8	12	70.00
98110X	10	14	95.00
98112X	12	16	115.00

The introduction of *negative cutting angles* has made possible the use of carbide tipped blades for milling steel. Under proper operating conditions these cutters will greatly increase feed rates and improve finish and tool life.

Both medium and heavy duty series available with *inserted replaceable* carbide blades for lowest operating cost. You purchase *one* cutter housing for each application. You fill and refill this housing many times with *inserted blades* at fraction of replacement cost of new solid type cutters.



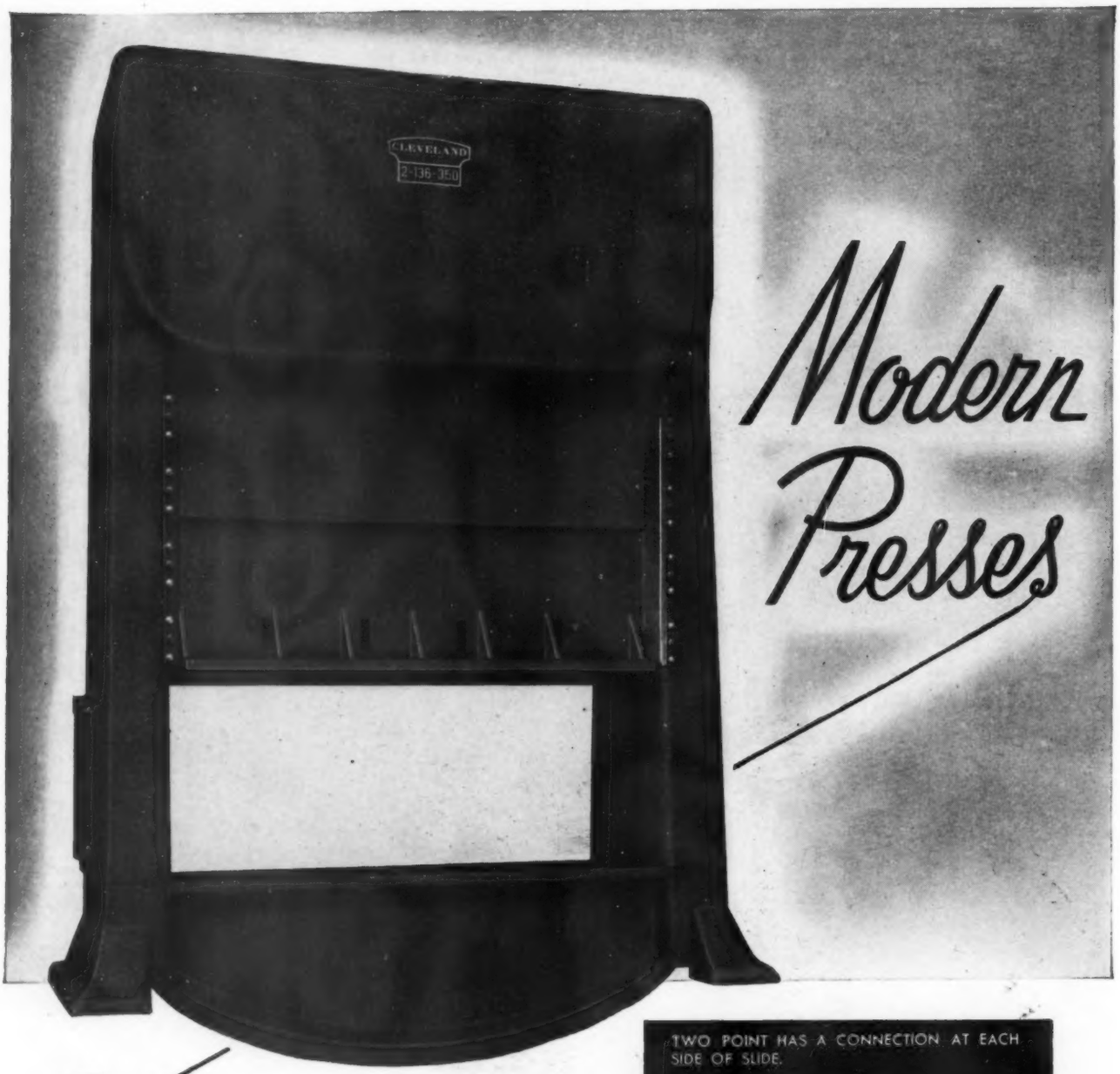
HEAVY DUTY 1/2" STOCK

Cutter No.	Diameter	Teeth	Price
94108XX	8	8	$ 90.00
94110XX	10	10	125.00
94112XX	12	12	150.00
94114XX	14	14	175.00

Ingersoll offers many other designs of *inserted blade* milling and boring tools with carbide tipped, cast alloy, and high speed steel blades — Face mills, end mills, slotting cutters, helical slabbing mills, cylinder boring and combination boring, facing and chamfering tools.

Write for catalog giving complete details on inserted blade milling and boring tools.

THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILLINOIS



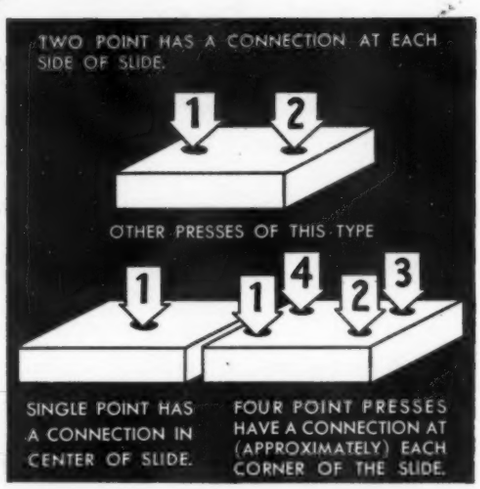
Modern Presses

For MAXIMUM PRODUCTION

Manufacturers of sheet metal products interested in "stepping-up" production to reduce manufacturing costs and to meet the pent up demand for their products, will find it advantageous, as many leading manufacturers have, to consider the installation of Modern Cleveland Presses which are designed for speed, accuracy, and economy of operation.

Furnished in three types, in sizes and capacities to suit requirements, they can be equipped with either air or hydraulically operated friction clutch and brake, electrically controlled, a feature which reduces physical fatigue and provides for safe operation of the Press at all times.

The Cleveland Two Point illustrated above is rated at 350 tons capacity, has 24" stroke, 12" adjustment, 56" Shut Height, 60"x136" bed area and operates at 14 strokes per minute.

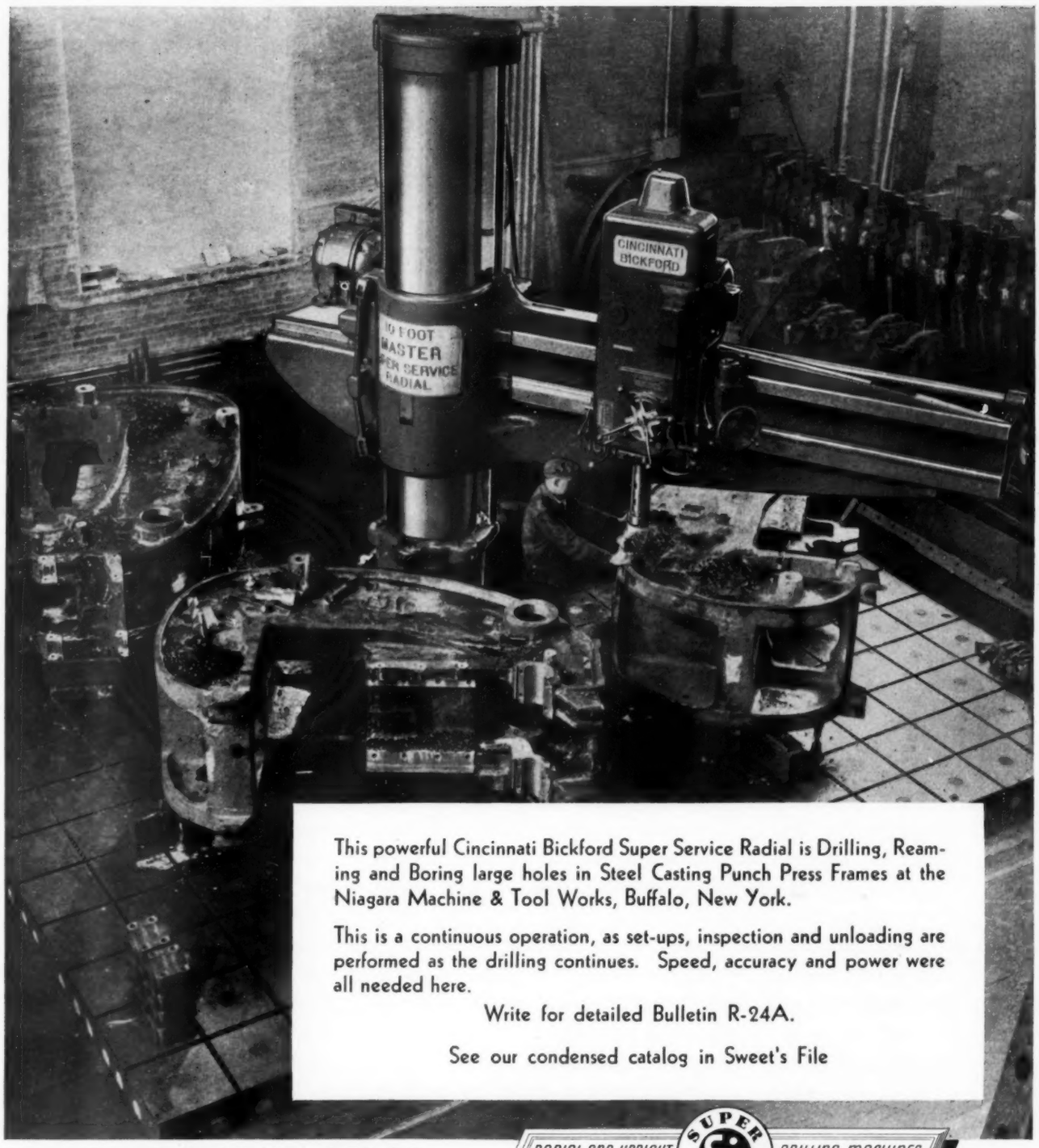

TWO POINT HAS A CONNECTION AT EACH SIDE OF SLIDE.
1
2
OTHER PRESSES OF THIS TYPE
1
1
4
2
3
SINGLE POINT HAS A CONNECTION IN CENTER OF SLIDE.
FOUR POINT PRESSES HAVE A CONNECTION AT (APPROXIMATELY) EACH CORNER OF THE SLIDE.

CLEVELAND PUNCH and SHEAR WORKS COMPANY

EAST 40th and ST. CLAIR AVENUE • CLEVELAND 14, OHIO

District Offices NEW YORK • CHICAGO • DETROIT • PHILADELPHIA • PITTSBURGH

THE machine TO DO IT...



This powerful Cincinnati Bickford Super Service Radial is Drilling, Reaming and Boring large holes in Steel Casting Punch Press Frames at the Niagara Machine & Tool Works, Buffalo, New York.

This is a continuous operation, as set-ups, inspection and unloading are performed as the drilling continues. Speed, accuracy and power were all needed here.

Write for detailed Bulletin R-24A.

See our condensed catalog in Sweet's File

Courtesy of Niagara Machine & Tool Works, Buffalo, N. Y.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9. Ohio U.S.A.

3 MORE CUTS PER TOOL GRIND

BETTER FINISH

LONGER TOOL LIFE

EFFECTIVE cutting fluids assure these benefits. *Texaco Cutting and Soluble Oils* have proved their effectiveness on all metals and with all methods of machining. They lubricate and cool the tools, prevent chip welding, permit higher cutting speeds, reduce scrap and downtime for tool changes.

In splining, for example, one plant — by switching to Texaco — *tripled* the number of shafts cut per hob setting. This is typical of the way Texaco cutting fluids can improve results from all forms of metal cutting.

Let a Texaco engineer trained in the proper selection and application of cutting fluids help you increase your machining efficiency. Call the nearest of the more than 2300 Texaco distributing plants in the 48 States, or write:

☆ ☆ ☆

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO CUTTING, SOLUBLE AND HYDRAULIC OILS FOR FASTER MACHINING

TUNE IN THE TEXACO STAR THEATRE WITH JAMES MELTON SUNDAY NIGHTS ★ METROPOLITAN OPERA BROADCASTS SATURDAY AFTERNOONS

Test of OPA Sincerity

Federal officials have proclaimed repeatedly that as soon as production nears demand, price ceilings will be lifted and the free-market theory again will operate.

Machine tools are a test of their sincerity. The peak in the machine tool industry occurred in 1942, or four years ago. Since then sales and output have steadily declined.

Today production is down to 20% of the wartime top. Some builders are busy, others are not. The industry in general can make fairly reasonable deliveries. Those companies that cannot promise satisfactory deliveries are losing business to those that can.

Machine tool builders are not in the enviable position of automobile manufacturers who face a huge backlog of orders that represent full production for a considerable period ahead. Nor are they in the fortunate position of makers of household appliances and a hundred other items that people have not been able to buy for several years.

Instead of wondering how they are going to be able to meet the unprecedented demand, they are speculating about where they can turn to get enough business to keep their plants and workers engaged.

In short, the machine tool industry already has been thoroughly deflated. The argument is no longer valid that buyers must have machines at any price. What excuse then is there for Washington's adamant attitude in refusing to remove the unnecessary price ceilings on machine tools?

Fears are ill-founded that prices will soar alarmingly if the lid is taken off. Competition would prevent that. Any builder who attempted such action would expose himself immediately to devastating competition by his rival. Moreover, buyers are resistant to paying more than a reasonable price for new machines.

In addition, the machine tool industry is ever conscious of the competition it must meet the next few years from government surplus machine tools. If prices of new machines were excessive, purchasers would turn to RFC to fill requirements.

The British government held the British machine tool industry under a tight price control during most of the war. But as war needs for machine tools slackened and British builders' production declined, price ceilings were removed completely. That was prior to the end of the European phase of the war. Since then there has been no price control of British machine tools. Prices, as a result, have risen only about 10%.

Why is it that with a parallel situation here, with an even greater deflation of our machine tool industry than of the British, Washington refuses to act?

It is time that OPA makes good on its promises that it does not intend to continue controls after a reasonable balance is struck between supply and demand. If it does not, it is open to the charge that its use of that argument is a subterfuge to promote a change in our economic structure which the American people have not authorized.

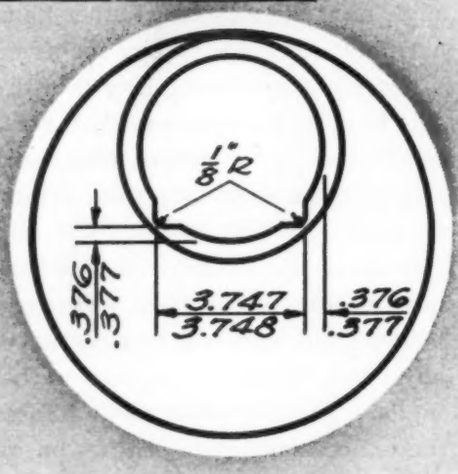
Burnham Finney

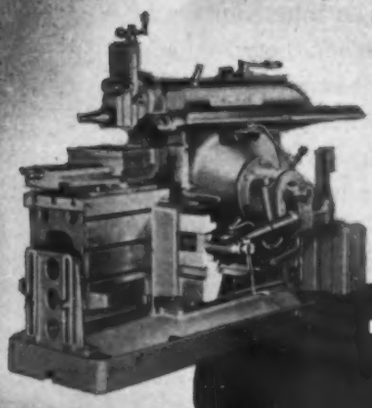
INTERNAL SHAPING...

In the field of internal shaping alone, Cincinnati Shapers are used on a long list of "hard to get at jobs"—from cutting internal key ways to cutting symmetrical and non-symmetrical holes.

We show a Cincinnati Shaper shaping internal key ways in a blind hole—a "hard to get at job." Remember, a Cincinnati Shaper, the tool of many uses, will always be busy in your shop.

Write for Catalog N-2, describing these powerful accurate Shapers.





THE CINCINNATI SHAPER CO.

CINCINNATI OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

Hydropress Blanks Boiler Plate

A 3500-ton press with 1000-ton pressure cushion provides flat and accurate parts from steel stock up to 7/8 in. thick

BY WALTER J. KAMP
Supervisor of Design, Caterpillar Tractor Co.

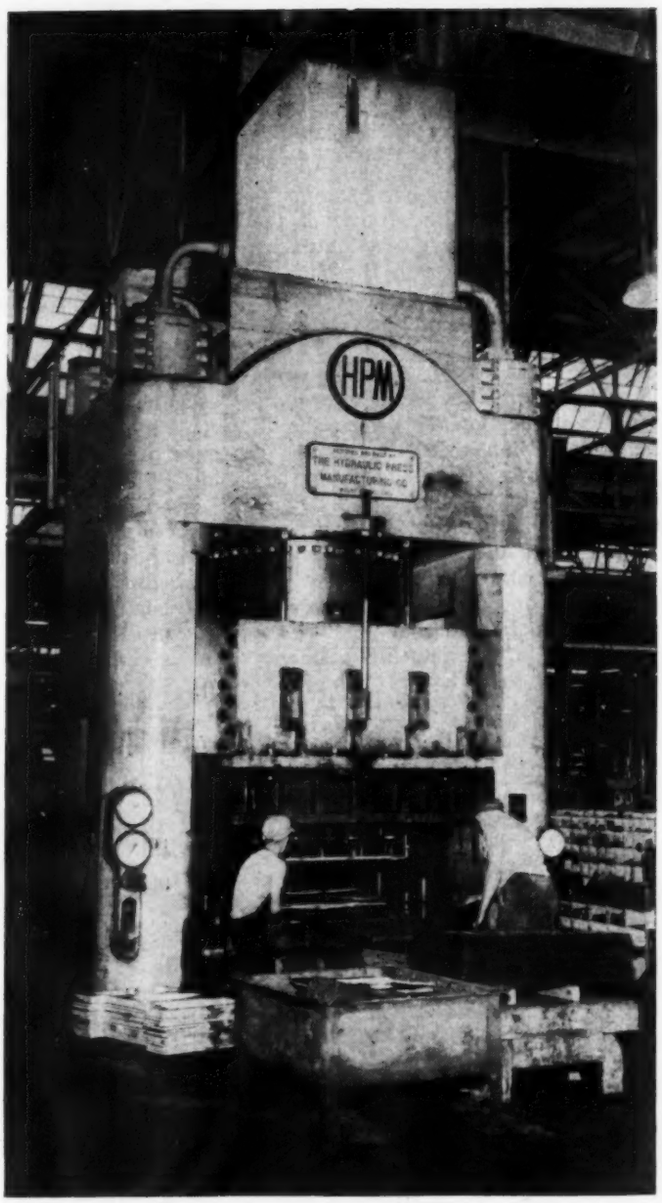
AT THE PEORIA PLANT of Caterpillar Tractor Co., a 3,500-ton HPM hydraulic press equipped with 1,000-ton pressure cushion has been used for several years to produce heavy blanked parts ¼ to ⅞ in. thick with sufficient accuracy that they can be used without straightening in the fabrication of large weldments.

Experimental development of blanking dies for this press has shown that many design rules must be changed to produce satisfactory blanking dies for hydraulic presses. Today, development has been carried forward to the extent that the report of a punch passing through a piece of heavy metal seldom is heard. In addition, it is unusual when a die must be returned to the toolroom for resharpening during a press run.

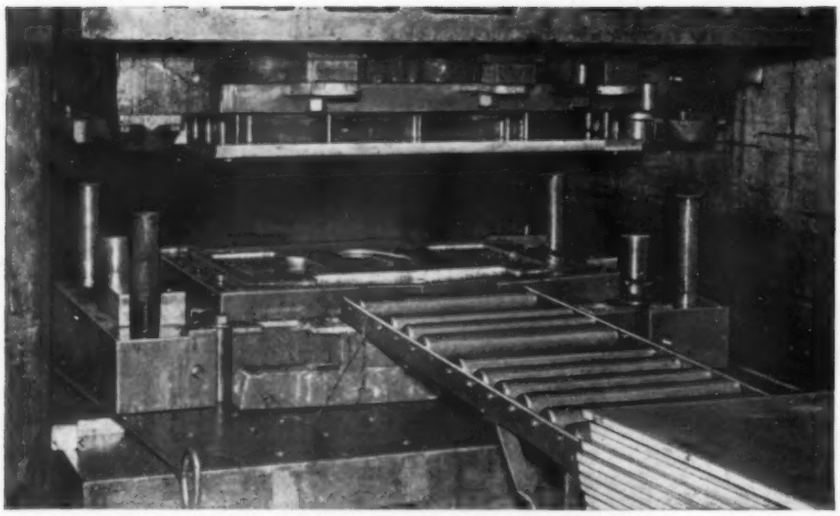
A principal advantage of blanking heavy sheet-steel parts in the hydraulic press is the high degree of flatness obtained if certain rules are observed. Parts that do not require straightening before assembly reduce manufacturing cost materially. To obtain this flatness, it is necessary to use a press equipped with a cushion of sufficient tonnage to maintain a squeeze on the parts being blanked.

For blanking steel-plate sections ranging from ¼ to ⅞ in. in thickness, it has been found best to design so the die assembly is mounted on the lower shoe and the punch assembly on the upper shoe as in a simple blanking die for a mechanical press. The plate to be blanked is rested on a pressure plate or stripper supported above the lower die members by traveling pins connected to the hydraulic cushion in the press bed. In this way, the part is squeezed between the punch and the pressure plate while the punch forces the part into the die member. The cushion below the die supplies sufficient holding pressure to keep the part flat during blanking.

The upper steel or punch of the die set is flat on all cutting faces, and all faces are on the same plane. This permits the punch member to be ground without removing it from the shoe. Stripper plates are



Caterpillar uses a 3,500-ton self-contained hydraulic press for blanking parts from steel plate up to ⅞ in. thick. A 1,000-ton cushion is assembled in the bed on this press



A section of roller conveyor makes it easy to move a blank into the die in this setup. Shear and stepping on lower die members is shown. This die blanks a 5/8-in. thick hot-rolled steel plate

used in this top member for removing the slugs and the frame of the scrap. These plates are actuated by pins that reach through the shoe to a knockout bolster plate on the ram. This plate, in turn, connects with the ram knockout bars.

Shear on the lower die member is important in the development of a die for this application. This shear should be at least half to full thickness of the metal; often it will be found advantageous to use considerably more shear. The amount of shear to use on the lower die member requires a lot of thought and experiment for each type of part and thickness of metal to be blanked.

Stepping of the cutting members of the lower die is important, also, as the steps lighten the cutting load. If shear and stepping are properly applied, the load can be so distributed that a steady, even cut will result, there will be no noise at breakthrough, and often the tonnage required will be reduced by as much as half. This is a decided advantage for a hydraulic press, with its steady even push and small danger of stalling.

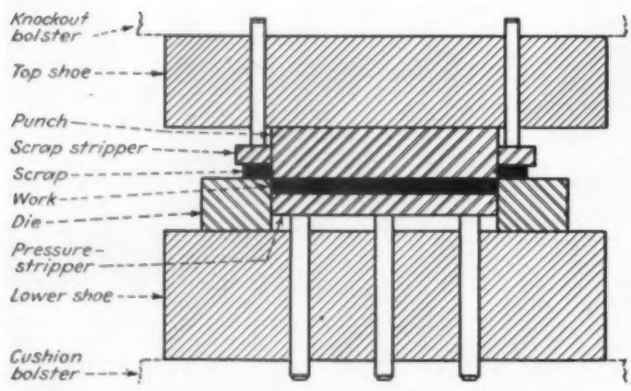
In designing a blanking die with a combination of shear and stepping, a number of factors must be considered. From the moment the upper member of the die, or punch, comes in contact with the blank until the cut is completed, angle of shear and height of the stepped members must be arranged so the pressure required for cutting will be as uniform as possible throughout blanking. Often, it is desirable that blanking pressure be reduced gradually as the punch travels through; that is, the heaviest part of the load is applied at the start of the cut and the lightest part at the end. Shear on the last detail that goes through the blank thus eases the part out and results in quiet cutting.

Shear-Step Combinations

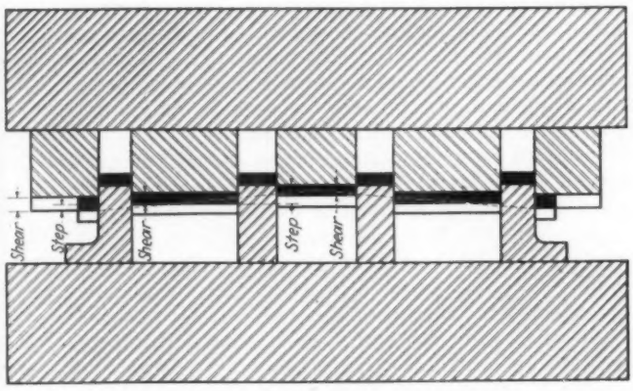
A good example of continuous cutting is to be found in the splitting shear. Here, it will be found that pressure develops quickly to the maximum, then is constant throughout the cut, with a not too sudden drop-off at the end. In properly designed dies for hydraulic blanking, the same quick rise in pressure develops, but instead of a constant pressure, pressure slowly diminishes with a smoothed-out pressure drop-off at the end. All this is accomplished by proper combination of shear and stepping, as indicated in accompanying sketches.

Steps with sheared faces should be arranged so at no time during the cut is there a dwell or dead spot. Of course, it is almost impossible to produce an exactly uniform pressure on some jobs, so pressure will rise and fall somewhat, but this will cause no trouble as long as the last portion of the cut is eased out by the punch.

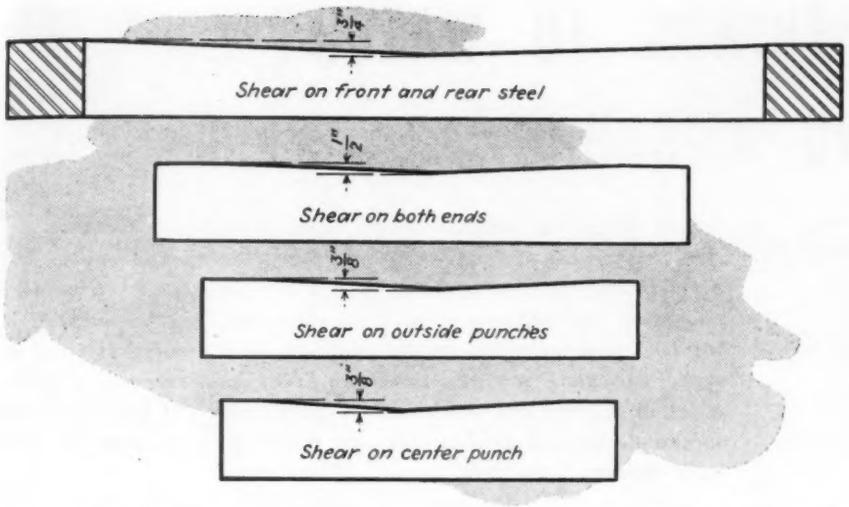
Clearance between the cutting-steel sections of the punch and die members has a direct bearing on the tonnage required for hydraulic blanking.



Blanking dies on the hydraulic press incorporate a pressure-stripper member supported above the cushion by traveling pins. Punch members on the upper shoe are ground flat, without shear or stepping. Shear and stepping is provided on the lower die members so the cutting action is distributed throughout downward movement of the punches through the blank



This sectional view of the heavy blanking die for 5/8-in. thick plate shows a combination of shear and step. For clarity, strippers and knockouts have been omitted. Punch members are all on the same plane, while die members are on three levels, with each level sheared. The center punch eases out the cutting load, making this die practically noiseless in operation



Shear diagram for the blanking die on 5/8-in. thick steel plate. Shear and stepping of the die members should be set when the heaviest load is applied at the start of the cutting action, with the pressure being reduced gradually as the punch nears the bottom of its stroke

It also directly affects cutting action of the die and accuracy of the finished part. The ideal condition is what is known as a "single break" of the metal, but if it is necessary to hold the metal contour to close tolerances for assembly, a "double break" cannot be avoided at times.

Clearance Adjustment

Clearance is not a constant factor, and must be adjusted to meet requirements of each job if desired results are to be obtained. As a general rule, 10% over-all clearance is adequate for ¼-in. steel plates, 15% for ⅜- to ½-in. steel plates, and 20% for thicknesses of ⅝ and ¾ in.

Shown is a typical die for blanking a ⅝-in. hot-rolled steel plate of approximately 0.15-0.20 carbon content. The work must be held to fairly close tolerances on outside dimensions. The holes pierced are cover openings and dimensions need not be held closely. Punch members in this die-set for cutting the outside contour of the part are carried in the top die shoe, the die being mounted in the lower die shoe. Punches and dies for the openings in the opposite members make up a simple compound die. The pressure plate, which also serves as a stripper, is between the die steels on the lower shoe. Stock is gripped between the upper punch members and the pressure plate, holding it flat and carrying it to the dies.

All shear is on the die-steel members on the lower shoe. The upper steel is flat on the cutting faces and all are on the same level—stepping and shear being provided on the lower members only. In this die, a total of 15% clearance over-all, or 7½% on a side, was used. This makes a "double break" and consequently raises required tonnage somewhat. But this condition is necessary for blanking this part, because of the tolerances that must be held on the outer contour. If a "single break" were desired, as much as 20% over-all clearance would be necessary.

Vertical faces of the die-steel members are made straight, or perpendicular to their base, with no relief. This might be expected to cause galling on the faces of the members, but experience has shown that if a generous amount of lubricant is used, there is no need for concern. Relieved die-steel spalls and chips, especially where tremendous pressures are encountered.

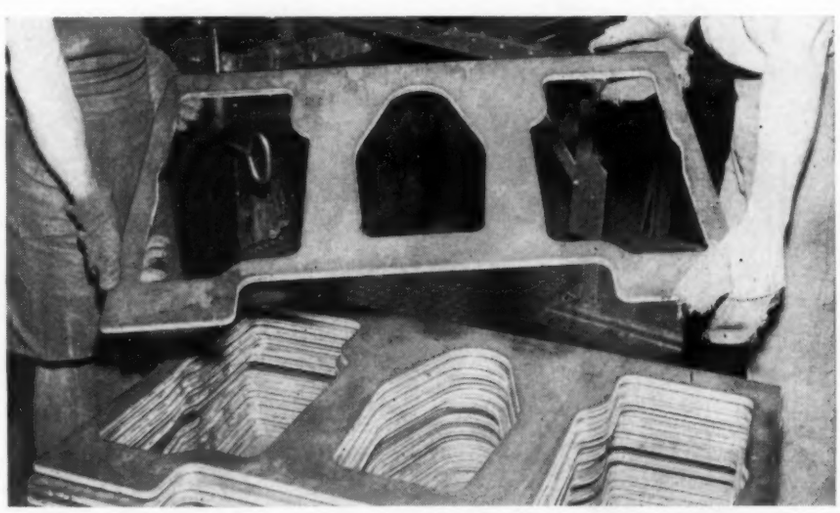
Blanking dies on large hydraulic presses must be well guided to keep them in accurate alignment while cutting. Extra-large guideposts or heel blocks should be used. Stop blocks are necessary also to stop the descent of the ram at the end of the cut. It has been found best to build such stops into each die, so close control of its cutting action can be maintained.

Air-Hardened Steel Best

For blanking or cutting heavy steel plates, air-hardening tool steels usually show longest cutting life between grinds and the least amount of breakage. In the die described, as many as 2,500 pieces have been run between grinds. In comparison with other cutting steels, this is remarkable. When made of tool steel of the oil-hardening variety, 800 pieces per grind was the maximum obtained, while the average was about 250 pieces between grinds.

The surfaces of the bolsters on which the die shoes rest should be flat and smooth, so they will provide full support, or a lot of cracked steel will result.

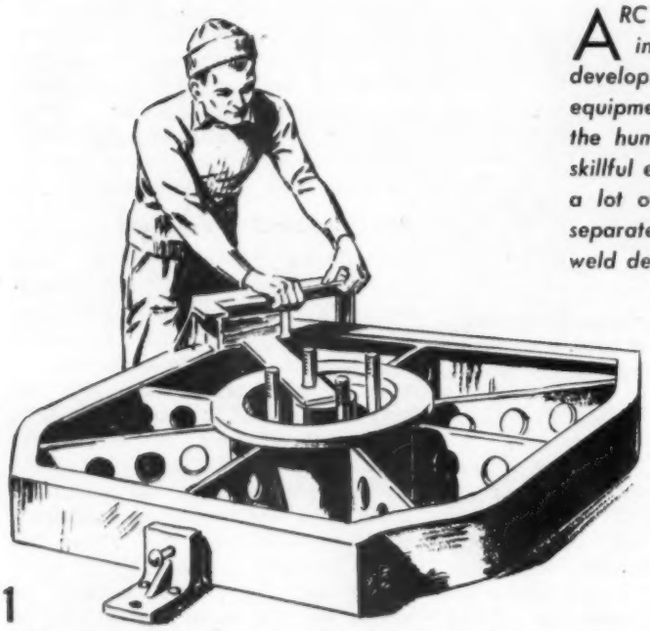
First cost of these dies is relatively high, but blanking of heavy steel plates in such dies is very economical if lot sizes are sufficiently large. Accurate blanking demands that extreme care be exercised in building and maintaining die members.



The finished blank comes from the die as flat as the plate from which it was punched. No additional straightening is necessary before welding into the assembly. Accuracy of dimensions is insured by proper die design

TEN THINGS TO WATCH IN MAKING A SOUND ARC WELD

ARC WELDING has proved itself to be an efficient method of joining metals. During recent years a great deal of engineering development has gone into the creation of closely controlled welding equipment and properly constructed electrodes. Less dependable is the human element—the careful planning of a welding job and its skillful execution. Attention to the ten points listed here will eliminate a lot of substandard welds. These points must not be considered separately but coordinated, one with the other, to produce the best weld deposit.



1

Fit all parts properly before welding. Too close a fit-up results in poor penetration. Gaps in the joints may cause bridging, skips and incompleted welds; or in endeavoring to fill the gaps in the joints, the welder may apply large amounts of weld metal, resulting in distortion and increased locked-up stresses

3

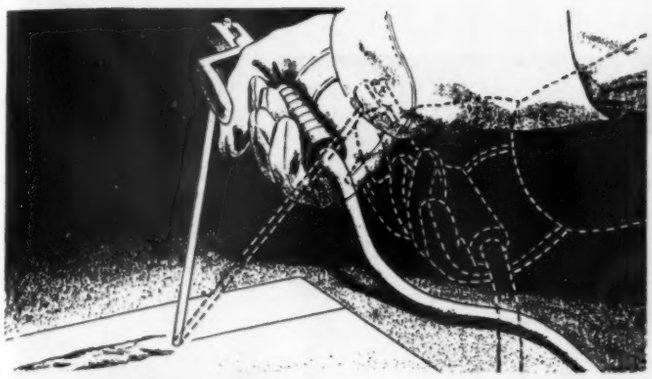
Keep the surface clean. Slag from the electrode getting ahead of deposits or slag from tack welds may be the cause of inclusions or omissions in the seam or "cold welds" characterized by lack of fusion. Surface dirt or scale may result in inclusions that weaken the weld

2

Position the workpieces to best advantage. Downhand welding is desirable on most work as it permits using higher currents and larger electrodes, increasing production. Vertically down is preferred on sheet metal as it produces the smoothest, fastest weld and the least distortion

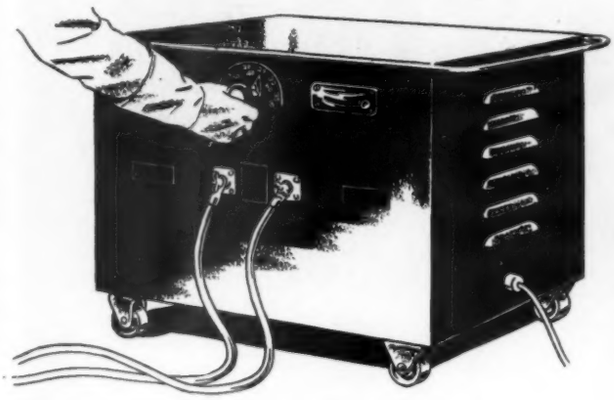
4

Choose an electrode of correct composition and suitable size. Electrode manufacturers are specific as to the types recommended for various applications. Too small an electrode results in poor penetration; too large an electrode in excessive deposition of metal



5 **Hold the electrode at such an angle (left) that parts being welded will be heated equally.** Otherwise, the concentration of heat on one part will cause unbalance and undercut. A bad angle (right) may also give erratic slag action and poor fusion on one side

6 **Select the proper rate of travel.** Too slow a rate of travel may result in lack of fusion at the root of a fillet or groove, cause burn-through on thin metal and increase cost. Too fast a rate of travel may produce undercut, poor and uneven-shaped bead and poor fusion



7

Use proper current for electrode size and metal thickness. If the current is insufficient, poor fusion, excessive deposit or gas inclusions in the deposit of metal will result. Too high a current may produce undercut or excessive spatter

8

Build a seam uniformly and do not attempt to repair defects by welding over them. Defects should be chipped out before rewelding. Avoid large and misshapen tack welds as they cause pockets in which slag and gas may be trapped before the tack can be fused in the final seam

9 **Arrange the welding sequence to give minimum distortion, elimination of as many causes of welding defects as possible and still be adapted to high production.** Analyze the problem of heat application and try to anticipate the resulting reaction

10

Avoid placing welds where they will be subject to excessive cold-working or bending of the joints. Cracks are likely to result, especially with the higher-carbon steels and alloy steels

BY H. SCHLARMAN

JONES & LAMSON MACHINE COMPANY

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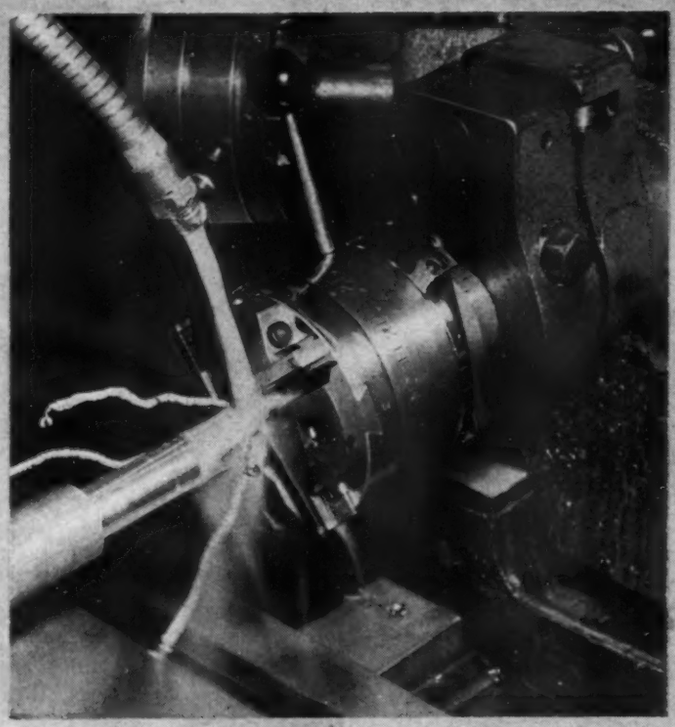
Until recent years threading has been the stepchild of the machining world despite the fact that it is a difficult operation. ...First of a series of articles explaining available equipment and some of its capabilities



THREAD CUTTING WITH DIEHEADS...I

Types of Dieheads and Chasers

RECOGNITION of good threads was slow in coming because conditions did not force industry to greater accuracy, and the majority of threading-tool manufacturers were content to let well enough alone. As our mode of life speeded up, the value of accurate threads forced itself on the consciousness of industry; threading became a major machining problem. The supply of men—never too great—who knew how to handle threading tools became proportionately less as the demand for better threads became acute.

It is true that threading tools have been improved, and these improvements have helped. However, no improvements can do away with the troubles that plague threading because of the nature of the threads themselves and the methods of producing them. Threading is an intricate forming operation. It has a number of dimensions tied together in such a manner that if one is wrong the whole result is wrong.

Threads are produced by six machining processes:

1. By single-point cutting
2. By solid adjustable or button dies (Fig. 1) and by acorn dies, (Fig. 2)
3. By self-opening dieheads
4. Thread rolling
5. Thread milling and hobbing
6 Thread grinding.

In this and following articles, only thread cutting with self-opening dieheads will be considered.

The three major classifications of self-opening dies are the radial, tangent and circular (The segment type falls in the radial classification because it is a small radial chaser). Dieheads are designed to hold a particular type of chaser in proper position and location for correct cutting action and to open automatically out of the thread so the die can be retracted rapidly over the work. All self-opening dieheads fulfill these requirements.

Various designs of heads for the same chaser may vary in efficiency by embodying greater strength of construction and fewer small parts, compactness, float, longer life as a result of material processing and design, and greater refinement in chasers.

In all the various classifications of dieheads there are two general types, namely: the revolving and the stationary or hand, Fig. 3.

The revolving type is just what the name implies. It is used where the die spindle rotates, as on automatic

screw machines, drillpresses and threading machines. Opening and closing of the die is actuated by a fork or yoke that fits into a groove around the outside of the head. This fork or yoke is controlled by mechanisms designed into the various machines.

There are instances when a revolving die is used as a hand or stationary die. However, these cases are the exception and are mostly instances of convenience or special machine setup or design.

The hand or stationary die has a handle and is never used where a die is required to revolve around its own axis. The hand die is always locked by its handle either by hand, as on a turret lathe, or by a finger or cam as on the Brown & Sharpe and Cleveland automatics. The stationary or hand die "pulls off" (opens up) at the end of the cut without help from an outside mechanism such as is required on a revolving head.

The radial was the first self-opening diehead. It was extensively used on hand and automatic machines. Other types of heads were introduced later. All these heads have overlapping and individual fields in which they have advantages.

Performance of Various Types

An analysis of the characteristics inherent in the various types of chasers, and the possible heads designed around them, follows.

The radial chaser lends itself to a design allowing for larger diameter thread capacity within a certain fixed outside diameter of head than do the so-called "long-life" tangent and circular chasers. When special conditions are such that a large thread capacity is required of a diehead with a relatively small outside diameter, it is usually found necessary to resort to the radial head.

There are many large-diameter, coarse-pitch threads having a steep helix which must be cut with the radial head. Under these conditions, the radial has these advantages. Chasers can be supported more rigidly; chasers can be wider to allow a good length of chamfer and still have a number of full guiding teeth; more chasers can be designed into a fixed outside diameter of head; the head is adaptable to rough and finish cuts; swing of the machine is too small for the outside diameter of a suitable longlife chaser die.

Either right- or left-hand chasers can be used in the same radial head without any adaptions.

The radial chaser, whether full-sized or segment, is essentially a short-life chaser. The advantage of the segment is that is can be manufactured so that the cost per grind would be less than for the full-sized radial. It is not, however, suitable because of its small size, for coarser-pitch threading. Dieheads designed around the segment chaser of necessity require a number of holders in larger-range heads.

The radial chaser is inherently a chaser difficult to resharpen. It requires more time, knowledge and experience than any other. Interdependence of the cutting and guiding teeth bearing, restrictions on hook changes, variations of top rake as a result of clearance changes—all these demand knowledge and experience for proper handling. The difficulty of resharpening a radial chaser increases with the number of resharpenings. It sums up to providing clearance for a dullness that cannot be removed entirely.

Breakage in the radial chaser is more of a problem than in the long-life chaser types. A break in the radial is likely to ruin the whole set.

Radial chasers are not efficient for close-to-shoulder threading. Close-to-shoulder work greatly increases breakage costs, consumes more time in resharpening, and necessitates repositioning of the die for correct thread length each time the chaser is resharpened in the chamfer. Extension-type radial chasers, sometimes used for close-to-shoulder work are inherently more expensive and liable to breakage.

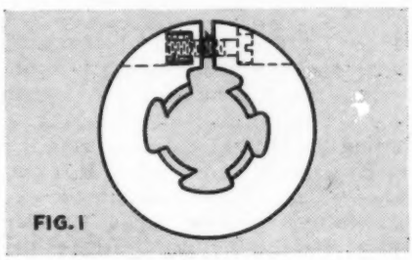


Fig. 1—The button die consists of a split adjustable nut in which flutes have been machined to provide cutting edges

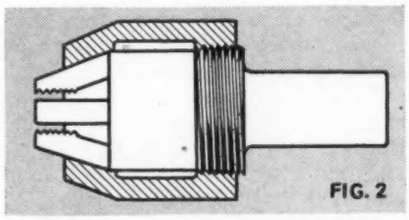


Fig. 2—The acorn die consists of a solid nut in which grooves have been machined to produce fingers (usually four) so pitch-diameter adjustments can be obtained by a collar that fits over the fingers

The tangent chaser is a long-life chaser because it can be resharpened a great many times. When the worn part is ground off, it is equivalent to a new chaser.

Two types of dieheads are possible in the tangent type: heads using chasers without helix, and those using chaser with helix.

Chasers without helix have the spacing in the chaser and the helix on the chaser holder. Because of this fact each size of thread theoretically requires a separate set of holders since each has a different helix. Practically, this holds true for really accurate threads, especially for long nut engagements. Normally, however, it is possible to use one set of holders for a few thread sizes whose helix angles are fairly close together. This means that the holder will have the average helix between the maximum and minimum of the threads chosen for the holder. This works out well enough for short nut-length threads provided the spread between the helix of the maximum and minimum threads is not too great. However, this scheme would cause trouble on really accurate threads because of off-lead of the threaded part.

One of the most troublesome factors of any head that has the helix on the holders is the difficulty of setting the chasers for cutting bearing and spacing. If provisions are not incorporated in the diehead so chasers can all be positively and evenly set relative to center, then not only will the cutting action be affected adversely but also the spacing (thread-form control) will be off; both are dependent on the eveness with which chasers are set relative to center.

A positive method of positioning all chasers relative to center is also extremely important. It permits duplication of positioning of the bearing for the material being cut, as different materials require different bearing (distance cutting edge is above center).

It is possible to replace individual chasers in a set of tangent chasers without helix. This is advantageous in places like forge shops where Class 1 or 2 threads are cut over hot-forged stock, which causes excessive breakage. However, on automatic or hand screw machines, breakage is not too troublesome a factor. If it is, then the chasers are too hard, or it is a warning that the grind is not right or the machine setup is wrong relative to

alignment, speed and lubrication. Provided proper holders are available, tangent chasers without helix of a certain pitch can be used on various diameters.

Holders for left-hand threads are required in the same manner as for right-hand. However, tangent chasers without helix can be used for cutting either right- or left-hand threads.

The tangent chaser with helix is independent of the chaser holder. Because the helix and spacing are machined in the chaser, extra chaser holders are not required. This type of tangent chaser permits a holder design wherein only one set is required for the range of the head.

It is absolutely essential to trouble-free, efficient working of a die using tangent chasers with helix, that some positive method of checking grinding and setting of the chasers be provided. If this is not provided, this chaser is liable to the same troubles of varied bearing and off-spacing as the tangent chaser without helix. If it is provided, the tangent with helix can be the easiest of the tangent types to control for continued accurate production over semi-finished or finished stock.

All tangent chasers with helix in a set must be ground to the same length. Because the helix is in the chasers, left-hand chasers would be required for left-hand threads. Left-hand holders would also be required.

Two Kinds of Circular Chasers

Circular chasers, like the tangent, can be made with or without helix. The circular chaser, like the tangent, is a long-life chaser. The circular with helix has the helix and spacing in the chaser independent of the holder. Because the helix and spacing is in it, the chaser lends itself to a design wherein only one set of holders would be required, regardless of pitch, form or diameter, for either right- or left-hand range within the stated capacity of the head.

A positive means must be provided for setting the chaser and measuring the bearing relative to center as well as relative to spacing or varied bearing and off-spacing would result. All chasers in a set must be ground the same. Left-hand chasers would be required for left-hand threads.

The circular chaser without helix has the helix on the chaser holder and the spacing in the chaser. Theoretically, for accurate threading, a separate set of holders for each size of thread is required. It would also be possible to make split helix holders, similar to those described for the tangent without helix, with the same liability of off-lead. Left-hand holders are required in the same manner as right-hand. A positive means of setting the chasers and measuring the bearing should be provided. It is not, however, possible to measure the exact cutting bearing on a circular chaser because the cutting edge is the juncture of two angles. Circular chasers without lead can be used for cutting right- or left-hand threads.

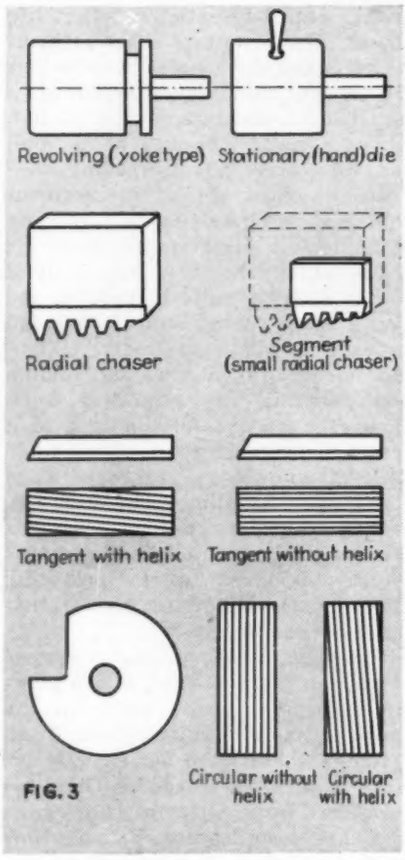


FIG. 3

Fig. 3—Dieheads and chasers are made in various types. The diehead (revolving or stationary) takes its name from the kind of chaser it uses

Conditions of threading are such that the manufacturers and users of dieheads must give up some desirable features to obtain others they may consider more important to their particular field of threading.

To get accuracy in cut threads, chasers must be ground and sometimes lapped besides. It is a simple fact that a tool cannot produce accuracy if it, itself, is not accurate.

The die-hard advocate of the cut-only and hardened chaser often claims that a cut threading tool will run longer than a ground chaser. It does, it is generally because of certain inaccuracies that give it a free cutting action, and this same free cutting action destroys the accuracy of the product.

It doesn't take a long memory to remember the day when a cut tap was the standard, and a ground tap was considered luxury. Today, the only place cut taps are found is in museums or five-and-dime stores.

The chaser is the cantankerous brother of the tap. If a tap, which is a solid piece, should be ground to reproduce accuracy, it certainly follows that four or six individual pieces (chasers) that must work as one should most certainly be ground to produce the same results. Radial chasers, particularly, should be ground in the threads, especially in the finer pitches.

For Long Threads

It is difficult to maintain any degree of accurate lead on the longer threads with any type of milled only and hardened chaser. Radial chasers for cutting long threads should be lapped and preferably ground in the thread before lapping.

All stationary dieheads should have a free vertical universal float, not merely a toggle-type float.

Dieheads for the Brown & Sharpes should be short, small in diameter and be equippable for either front knock-off or pull-off. The head should have provision for a cushioning action for the start of the thread.

The radial chaser should not be considered for general use in production on automatic or hand screw machines, or threaders. It finds its major usefulness as a jobbing head for diversified short-run jobs where die capacity is a greater factor than chaser life, or on the production of coarse-pitch threads in the larger sizes beyond the capabilities of the long-life chasers.

Neither the radial segment, the tangent, or the circular chaser is particularly suited to production of the coarser of the coarse pitches of threads. However, any of these types will out-produce the full-sized radial on average production threading on the basis of pieces per chaser dollar.

The tangent and circular types are particularly advantageous for close-to-shoulder threading and have the added advantage of being variable as to rake and cutting bearing.

It should be remembered that in dieheads, as in everything else, regardless of the out-and-out mechanical superiority and efficiency, many outside factors influence selection. There are both unbiased and biased opinions for and against any type of equipment.

Why Tool Steels Do Not Act Alike

Tool steels, like people, have personalities: they reflect what went into them. So, if you want to match steel to tool, here is a compilation of metallurgical facts seasoned by experience

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IT IS STILL customary to blame the hardener when anything goes wrong with a tool. This practice might have been all right in the early days of metalworking, when there were so few types of tool steel that most tools were made of the same material and variation in properties was obtained by heat-treatment. But now, tool steels fall into five well-defined groups that embrace over two-score general analyses. So, under the circumstances, the ultimate responsibility for satisfactory performance of tool must rest upon the tool designer. For it is up to him to correlate tool-service requirements and the properties of available tool steels, and by so doing to select a suitable material.

The accompanying table, "Classification of Tool Steels," lists five groups: (1) carbon-tool steels, (2) alloy tool steels, (3) high-chromium and air-hardening steels, (4) hot-work steels and (5) high-speed steels. Under each group heading there is given the general analyses which are representative of hundreds and perhaps thousands of tool steels produced by various manufacturers.

In general, the characteristics of the five classifications of tool steels are as follows:

I—CARBON TOOL STEEL

This is the tool steel of industry. Sometimes called "plain-carbon steel," or just "tool steel," it is the most widely used and adaptable material for tool purposes, except that it does not possess red hardness and hence its use for cutting tools is not as extensive as it was at one time. The carbon range is roughly 0.70 to 1.30% and the silicon and manganese contents are nominally ¼%. The so-called carbon-vanadium steel is obtained by adding ¼% of vanadium; the carbon, low-chromium steel by using ¼ to ½% chromium. But the properties of these steels differ so little from straight carbon-tool steel that they are classed with it.

Carbon tool steel couples good all-around properties with ease of handling. It hardens readily in water or brine to extreme file hardness. Although the depth of hardening is definitely limited on a tool of any size, the hard surface is backed by a soft, tough core. This combination gives shock resistance not possessed by many of the more expensive alloy steels. Forging and hardening practices for carbon tool steel are relatively simple, and the material can be reworked and rehardened a number of times without harmful results.

II—ALLOY TOOL STEEL

These are special-purpose steels as distinguished from the general-purpose carbon tool steels. They comprise a large group and their definition is difficult. For the purposes of this article, an arbitrary limit for total alloy content is set at 6%. Steels similar to No. 4 (See chart) sometimes known as non-deforming steels contain enough alloy, principally manganese, so they harden with an oil quench. Carbon content averages 0.90%, manganese 1.40%, and small percentages of tungsten, chromium and vanadium may be added. Major applications of such steels are: tools where minimum distortion is required in hardening, and intricate tools where the risk of breakage upon hardening would be too great with a standard water-hardening steel. A disadvantage is inability to attain the extreme keenness of a cutting edge.

Despite its name, steel No. 5 (fast-finishing or semi-high speed) is not in any way a high-speed or fast-cutting tool steel. It is actually a water-hardening, high-carbon tool steel containing some tungsten, and was developed for turning chilled iron-rolls.

Tungsten steels comparable to No. 6 are used for taps, hacksaws, and special purposes. No. 7 represents a group of steels used for rolls, forming and swedging tools, jeweller's dies.

The remainder of the group, Nos. 8, 9, 10 and 11, are called shock-resisting steels. They are used on cold and hot work, where fatigue resistance, toughness and resistance to battering are more important than extreme hardness. Examples of use are: chisels, punches, heavy-duty shears and rivet sets.

III—HIGH-CARBON, HIGH-CHROMIUM and Air-Hardening Die Steels

The high-carbon, high-chromium and air-hardening die steels are characterized by great resistance to wear, non-deformation on hardening, considerable resistance to softening under heat, though not to the same degree as high-speed steels, and ability to harden in large sections in either oil or air. No. 12 represents the general type. As first introduced, this class of die steel was an oil-hardening grade, later it was made to air-harden by the addition of molybdenum. Type No. 13, a still later development, is definitely an air-hardening variety, and the lower carbon content seems to add toughness without sacrifice of wearing properties. A lower-priced modification of these steels, No. 14, was brought out for blanking silicon-steel sheets used in the electrical industries. Steel No. 15, not so widely used is another lower-priced modification, which can be quenched at approximately 1550 F. instead of the

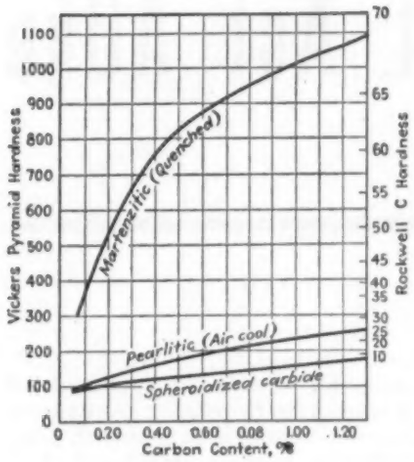


Fig. 1—Carbon is the prime element in hardening steel. With sufficient carbon present, hardness of martensite (the hardest component of steel) varies directly with carbon content

1750-1850 F. range required for the other three die materials.

IV—HOT-WORK STEELS

These steels, listed in order of descending heat-resistance, find use in extrusion, die-casting, forging and hot-upsetting. Steels 16, 17, and 18 are chromium-tungsten hot-work steels, in which tungsten is the main alloying element to impart heat-resistance. Some of the tungsten is replaced with molybdenum in steel No. 18. Of the remaining two, steel No. 19 is a chromium-molybdenum type, while steel No. 20 is a straight chromium variety.

V—HIGH-SPEED STEELS

High-speed steels possess two properties of interest to the tool designer: (1) the well-known ability to retain hardness while cutting at red heat, and (2) abrasion resistance at ordinary temperatures, a property that is too frequently overlooked. When hardened, such steels contain hard carbides embedded in a matrix as hard as the common tool steels, and this combination gives them superior wear resistance. So, high-speed steels may be used for hand hacksaw blades (where red hardness is not a factor) because these materials give more cuts and hold a better edge than carbon or low-alloy tool steels.

Effect of Alloys

The general classification of tool steels is helpful for selection purposes, but an understanding of the effect of the different alloying materials will assist in narrowing their specification in general shop practice.

Carbon—A greater range in physical properties can be obtained by varying the carbon content of tool steel than is the case with any other element. This basic fact is often forgotten.

Carbon content distinguishes steel from iron, gives steel the ability to harden when quenched from an elevated temperature. In steel, carbon combines with iron to form iron carbide or cementite. So, metallurgically speaking, steel is described as a dispersion of iron carbide in iron. Carbon in amount up to 0.85% can be held in solid solution on quenching. Above this point, the solid solution becomes supersaturated and excess cementite precipitates out of solid solution.

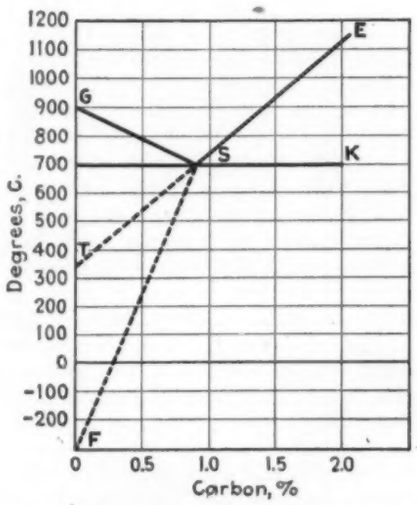


Fig. 2—Displacement of the iron-carbon eutectoid point S may occur in several directions, according to the effect of alloying elements in the steel

This is how carbon hardens steel: When the so-called dispersion of iron carbide in iron is heated above the critical point, the carbide dissolves in the iron (now in what metallurgists call the gamma state) to form a solid solution of carbide in iron known as austenite. If the steel is now cooled to room temperature at a rate faster than the critical cooling rate, the austenite is transformed to martensite, which is still a solution of carbide in iron, and represents the hardest state of steel. Fig. 1 shows how the percentage of carbon in the steel affects the hardness of martensite, hence the hardness of the steel.

Maximum hardness is developed in steel by adding carbon, not alloying elements. When the steel contains up to 0.85% carbon, upon suitable quenching all the carbide will be held in solid solution in the form of homogeneous martensite. As the carbon is increased above this point, undissolved particles of iron carbide will be found in the martensite. These particles increase the wear-resisting or cutting properties of the steel, even though they do not materially add to the intrinsic hardness of the martensite.

This explains why tool steels having above 0.85% carbon are useful. The 1.00 to 1.15% carbon range gives carbon tool steels an almost ideal combination of maximum hardness and wear resistance. Those with 80 to 90 points carbon, while having satisfactory martensitic hardness, do not have full wear resistance. Steels of 1.20 to 1.35% carbon have the most wear resistance, but are rather difficult to manufacture and are more sensitive to handling.

The practical effects of alloys upon hardness, strength and other properties of tool steels are better understood through a short discussion of what happens when they are added to an iron-carbon alloy. The addition of any alloying element affects the fundamental characteristics of steel in two ways: (1) a change in location of the critical point *Ac* on the iron-carbon diagram; that is, up, down or a widening of the point of cooling, and (2) a shift in the eutectoid point with respect to carbon content, either to left or right, but usually to the left,

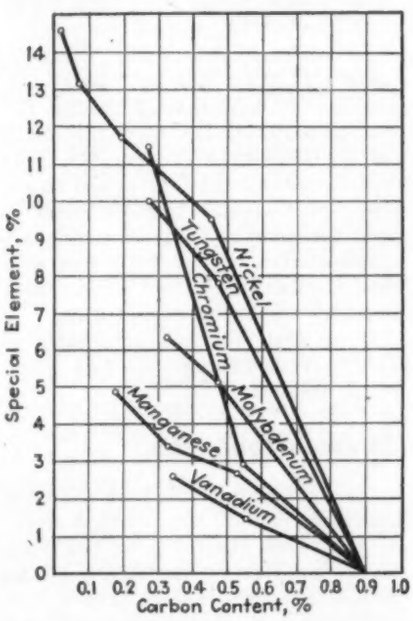


Fig. 3—An increase in any one alloying element does not necessarily produce a directly proportional decrease in the carbon content of the eutectoid

CLASSIFICATION OF TOOL STEELS

No.	Type	C	Mn	Si	Cr	W	Mo	Ni	Co	V
					I—CARBON TOOL STEELS					
1.	Carbon Tool	0.70/1.30	0.25	0.25						
2.	Carbon Vanadium	0.70/1.30	0.25	0.25						0.20
3.	Carbon Chrome	0.80/1.30	0.25	0.25	0.50					
					II—ALLOY TOOL STEELS					
4.	Oil-Hardening	0.80/1.0	1.0/1.5	0.25	0.60*	0.60*	0.60*			
5.	Tungsten Finishing	1.2/1.5	0.30	0.30	1.25*	3.0/4.5				
6.	Tungsten Tap	1.0/1.3	0.30	0.10	0.25/0.80	1.0/1.5	0.30*			0.25*
7.	Chrome Roll	0.85/1.25	0.15/0.65	0.35	1.1/1.85		0.50*			0.25*
8.	Chrome-Tungsten	0.40/0.60	0.15/0.70	0.15/1.15	1.50	2.50				0.25
9.	Chrome-Vanadium	0.45/0.60	0.20/0.90	0.35	0.80/1.20					0.25
10.	Chrome-Nickel	0.50/0.80	0.25/0.65	0.25	0.60/1.20		0.40*	1.25/1.75		
11.	Silicon-Manganese	0.45/0.70	0.30/1.20	0.70/2.25	0.50*		1.50*			0.50*
					III—HIGH-CARBON HIGH-CHROMIUM & AIR-HARDENING DIE STEELS					
12.	High-Chr. Oil-Hardening	1.7/2.4	0.35	0.35	10.0/14.0		1.0*		0.60*	1.0*
13.	High-Chr. Air-Hardening	1.2/1.7	0.35	0.35	11.0/14.0		0.50/1.0		3.5*	1.0*
14.	Air-Hardening Die	0.90/1.10	0.55	0.35	4.5/6.0		0.75/1.25			.70*
15.	Air-Hardening Manganese	0.95/1.05	2.0	0.30	0.80/2.0		0.80/1.10			1.0*
					IV—HOT-WORK STEELS					
16.	Tung. Hot-Work	0.25/0.55	0.30	0.30	3.5	7.0/18.0				0.40/1.20
17.	Chr. Tung. Hot-Work	0.30/0.45	0.30	1.0	5.0	4.5				
18.	Chr. Tung. Moly Hot-Work	0.30/0.45	0.30	1.0	5.0	1.25	1.50			0.40*
19.	Chr.-Moly Hot-Work	0.30/0.45	0.30	1.0	5.0		1.50			0.40
20.	Chrome Hot-Work	0.80/1.10	0.30	0.30	4.0		0.50*			
					V—HIGH-SPEED STEELS					
21.	Tungsten 18-4-1	0.70	0.30	0.30	4.0	18.0				1.00
22.	Tung. High-Van.	0.75/1.25	0.30	0.30	4.0	14.0/20.0	1.0			2.0/4.0
23.	Tungsten-Cobalt	0.70	0.30	0.30	4.0	14.0/20.0	1.0		3.5/12.0	1.0/2.5
24.	Tungsten-Moly	0.80/1.3	0.30	0.30	4.0	6.0	5.0			2.0/4.0
25.	Moly-Tungsten	0.80	0.30	0.30	4.0	1.5	8.5			1.2
26.	Moly	0.80	0.30	0.30	4.0		8.0			2.0
27.	Moly-Cobalt	Either 4, 5 or 6% Moly plus 3.5—8% Cobalt								

*Optimum percentage.
†The numbers applied to these steels are arbitrarily assigned for purposes of cross-references in the text.

as indicated in Fig. 2 (facing page).

In explanation of these matters, Everett L. Reed had this to say in A.S.M. *"Transactions,"* Vol. 20 (refer to Fig. 2):

"1. The displacement of the iron-carbon eutectoid point *S*, by a special element, does not necessarily mean a change in direction of the ferrite and cementite solubility lines. The movement of these lines is parallel to their original directions.

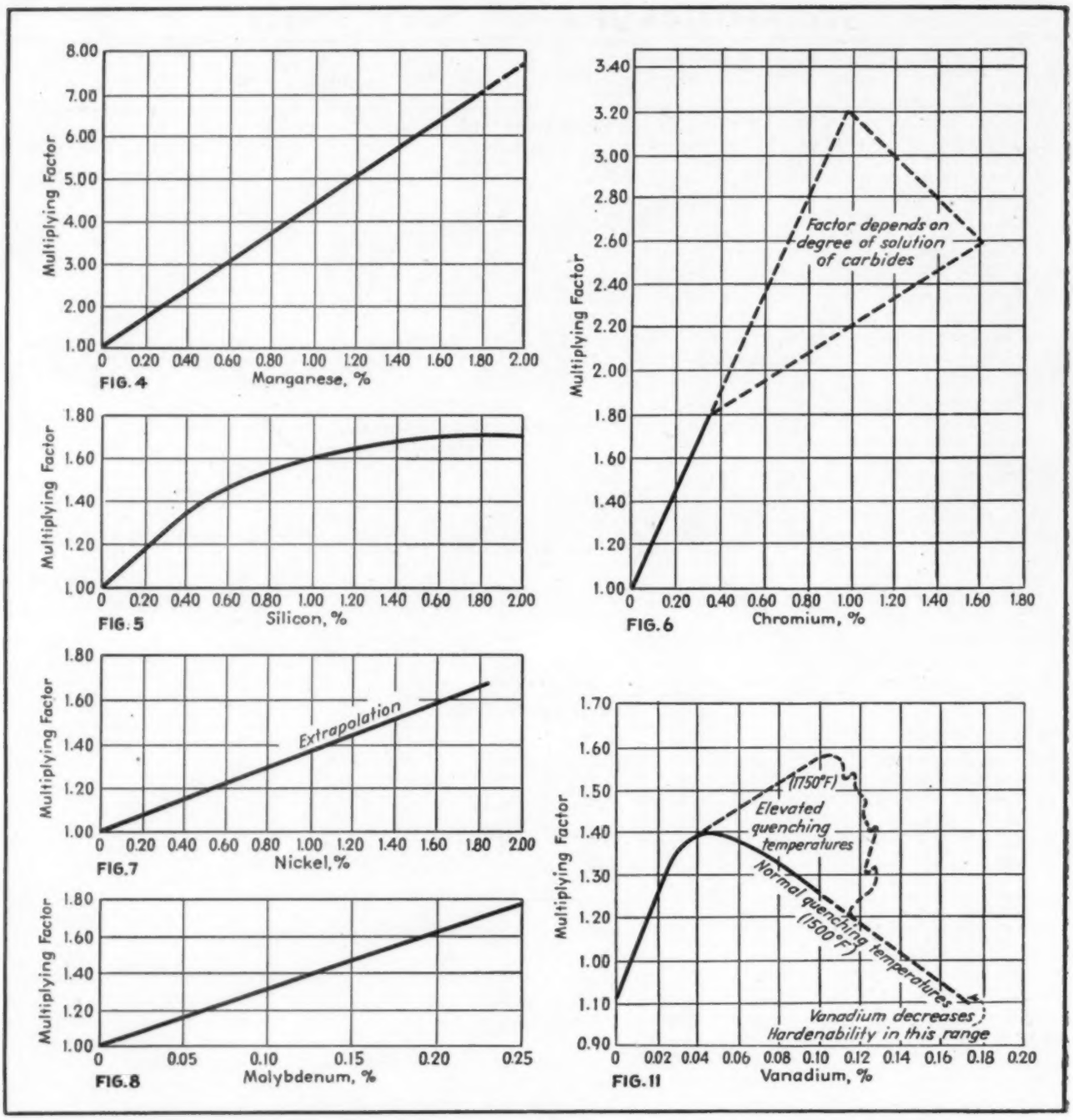
"2. Metals forming a solid solution with alpha iron but not forming carbides move the ferrite and cementite lines parallel to their original direction in such a way that the pearlite point moves along a straight line *SF* and crosses the temperature axis at absolute zero.

"3. The elements forming carbides but not soluble in alpha iron have no influence on the position of the ferrite line but cause a movement of the cementite line parallel to its original position in such a manner that point *S* moves along the ferrite line *SG*.

"4. The elements forming carbides and likewise soluble in alpha iron (the carbon percentage being constant) causes the movement of the ferrite and cementite lines (parallel to their former directions) in such a way that the point *S* moves along the straight line *ST* which crosses the temperature axis at temperature *T* situated between 900 C and absolute zero. The greater the ability of the alloying element to form carbides, the higher the temperature is raised. It has been determined that special elements which have a body-centered cubic lattice shift the eutectoid point in the iron-carbon equilibrium diagram to the left, while the face-centered elements (except nickel) displace the eutectoid point to the right. In other words, body-centered elements decrease the eutectoid carbon content and face-centered elements increase the carbon required to produce a eutectoid structure."

The author found that the lowering of the carbon content of the eutectoid was not proportional to an increase in alloying elements. Fig. 3 shows how the eutectoid point is moved to the left by several alloys. In detail, what are the effects of alloys upon tool steel?

Manganese, always present in steel in limited amounts, functions as a deoxidizer and desulphurizer, and has a strong effect upon hardenability. When alloyed with steel, manganese combines with ferrite to strengthen it, and also forms a carbide which is found associated with iron carbide. According to Fig. 3, manganese can be expected to move the eutectoid point to the left and to lower the



Alloying elements have different values in promoting hardenability. Grossman assigned a factor of one to the effect of carbon on hardenability. He derived curves of multiplying factors to show the increase hardenability caused when specific elements are added to tool steel. Obviously, manganese has the most powerful effect.

transformation temperature. This it does, the eutectoid point for 1% manganese being between 0.80 and 0.90% carbon. In addition, the AC_1 point is lowered 6° C for each percent of manganese and the Ar_1 point of transformation on cooling is lowered about 50° C. Manganese makes the transformation sluggish, the effect increasing with manganese content.

Manganese has a strong effect on the hardenability of steel; that is, the degree to which austenite is converted to martensite upon quenching. According to Grossman, the hardenability of a plain carbon steel is one: the hardenability of a steel containing carbon and another alloying element is greater or less than one by some multiplying factor. He derived curves, giving the multiplying factors when manganese, silicon, chromium, nickel, molybdenum, tungsten or vanadium is added to steel. It will be seen from Fig. 4 that manganese has a powerful effect upon hardenability. The addition of only 0.60% increases the hardenability three times that of plain carbon tool steel. Too much manganese makes tool steels susceptible to cracking upon water quenching. So, in the plain carbon tool steels, manganese is rarely permitted to exceed 0.35%, and is kept at a maximum of 0.30% for steels containing over 1.15% carbon.

As manganese lowers the eutectoid carbon and the critical point on cooling, it was possible to develop the well-known oil-hardening toolroom grades of steel. These steels possess the properties of low hardening temperature, ability to harden with an oil quench, and low distortion and safety from cracking in complicated sections.

Silicon also occurs in all steels. When added as a deoxidizer, the content is limited to 0.20%; as an alloying element it is used in the proportions of 0.50 to 5.0%. Silicon goes into solution in iron rather than forming carbides; it is not commonly considered to affect the position of the eutectoid point. The element tends to raise the AC_1 point; in small percentages it tends to increase hardenability as shown by Fig. 5.

In the tool-steel field, silicon is used as an alloy in shock-resisting and certain hot-work steels. Its content is usually kept low, because the element tends to promote brittleness in high-carbon steels and also may break down the iron carbide into graphite. Ordinarily, the maximum content is 0.30% when the carbon content is over 1.0%; otherwise, chromium, molybdenum or some other carbide stabilizer is added.

Chromium is present in practically all alloy tool steels. It forms carbides, but also goes into solution in iron when added in large quantities. In general, these are the effects of chromium additions: (1) the transformation point on heating is raised, the critical range is widened, and the transformation point on cooling is lowered, (2) considerable time at temperature is required for the element to go into solution, (3) the eutectoid point is moved to the left, and (4) the metal has a powerful hardenability effect, as shown in Fig. 6.

Hard, wear-resistant carbides are formed by chromium. In the higher carbon ranges, superior wear-resisting qualities are obtained through the considerable quantity of undissolved carbides in the structure. This fact is taken advantage of in respect to hardened-steel rolls, gages, high-speed steels and hot-work tool steels. Chromium in the range of 5 to 15% lowers the transformation point on cooling sufficiently to confer air-hardening qualities to die steels, and the alloy makes these steels extremely wear-resistant.

Nickel, in all proportions, goes into solution in iron. Its effects on steel are: (1) the critical range is widened, because the *Ar* point on cooling is lowered more than AC_1 point on heating, (2) the eutectoid point is moved to the left—for a 3½% nickel steel the eutectoid carbon is only 0.75%, and (3) the hardenability rate, Fig. 7, is increased at a much slower rate than by either manganese or chromium. Since nickel does not form carbides, it imparts hardness and strength to the steel as a whole, without loss of ductility. Nickel is not widely used as an alloying element for tool steels. It is limited in application to some of the shock-resisting steels and special hot-work steels.

Molybdenum forms carbides and has a rather strong effect on hardenability, Fig. 8. It tends to raise the critical point on heating and lower the transformation point on cooling. When the point at which cooling starts is raised, the transformation point is especially depressed, the *Ar* point is split and lowered progressively with increased molybdenum content, Fig. 9.

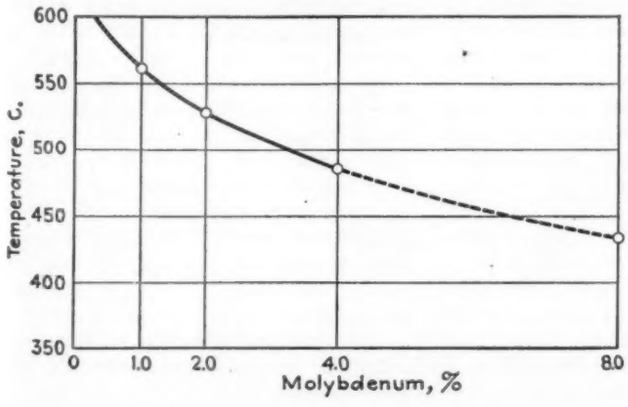
Thus, molybdenum is one of the most potent elements in imparting oil-hardening properties (also air-hardening properties when used in increased amounts) and causes steels to harden to great depths. It is practically never used as a single alloying addition to carbon tool steels; molybdenum is used as an intensifier to other alloys to promote greater hardenability, to take care of heavier masses, and to permit oil or air hardening.

Small amounts of molybdenum, under 1% and even less than ½%, can produce important effects. The 0.70% Mo high-carbon, high-chrome steel is a case in point. Before the inclusion of molybdenum, this steel was oil hardening only, but by addition of the alloying element, the steel was made air-hardening to reduce distortion. In oil-hardening toolroom grades of steel, small amounts of molybdenum aid the hardening of large tools.

Molybdenum is added in quantities above 1% in punch and chisel steels. But the importance of molybdenum in imparting to tool steel the maximum properties of deep hardening, resistance to softening and loss of strength under heat are realized when amounts from 3 to 8% are employed with various combinations of chromium, tungsten, silicon and vanadium.

Tungsten, like molybdenum, is carbide forming. Its effect on the eutectoid point is to move it to the left toward lower carbon contents. The transformation point on heating is not affected much, but the transformation point on cooling is split and lowered, particularly with an increase of initial cooling temperature. The multiplying factor from the hardenability curve

Fig. 9—When molybdenum is increased, the transformation point on cooling is progressively lowered



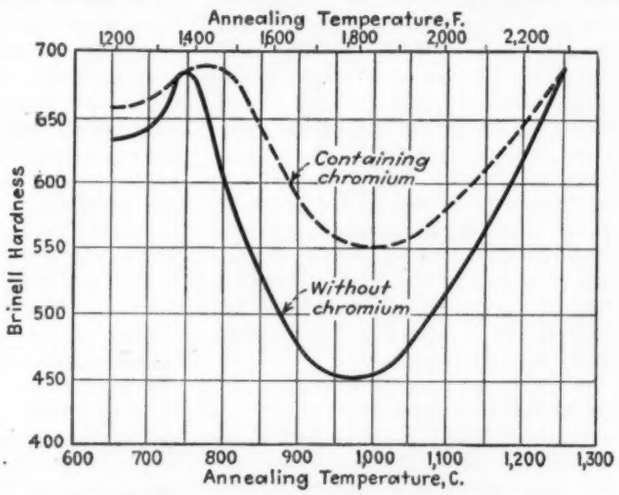


Fig. 10—Tool steels containing approximately 5% tungsten (and with or without chromium) will not harden satisfactorily if they have been annealed at certain temperatures. The remedy is to normalize the steel at high temperature to break down tungsten carbide and heat-treat again

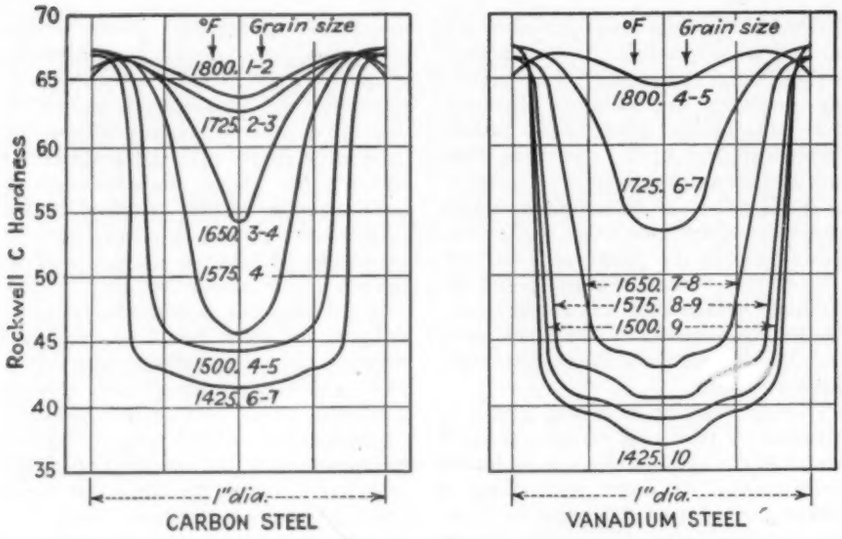


Fig. 12—Vanadium can both increase and decrease hardenability, as shown by Fig. 11, and also maintains fine grain size with increasing hardening temperatures

shows tungsten to increase the hardenability, but not in the same proportion as does molybdenum.

As an alloying element, tungsten finds its field of usefulness practically entirely in tool steels. Here, it has a definite function, contributing grain refinement, strength and cutting properties. Tungsten does this by lowering the carbon eutectic content and its readiness to form quantities of hard carbide particles, which aid cutting and prevent grain growth. Tungsten and molybdenum in many ways are similar, but molybdenum is roughly twice as efficient.

One property peculiar to tungsten alloy steels occurs when steels containing approximately 5% tungsten are annealed. It is found that such steels, when annealed at temperatures within certain ranges, and subsequently given normal hardening treatment, will not harden. This is illustrated in Fig. 10. This peculiarity is thought to be caused by formation of stable carbide WC, which removes tungsten and carbon from the solution so it will not harden. This effect may be prevented by care in the annealing and corrected by normalizing at a high temperature.

Without question, the largest use for tungsten is in high-speed steels. These comprise straight tungsten and tungsten-molybdenum types. There are also the hot-work die steels, where the tungsten adds heat-resisting qualities, preventing softening and erosion at elevated temperatures. The heat-resisting grades usually run from 5 to 12% tungsten, and the high-speed steels from 14 to 20% in the straight-tungsten types, and from 4 to 9% when combined with molybdenum.

Vanadium is a carbide-forming element and moves the eutectoid point to the left. Its influence in this regard is quite strong, but has only a slight effect on the transformation point; that is, slightly to raise the *Ac* point.

Vanadium has a very powerful effect on hardenability, although its properties in this direction are unorthodox. According to Bain, "Paradoxically, vanadium can be both deep and shallow hardening in its effect. When present as the undissolved carbide it promotes shallow-hardening but when dissolved in the austenite its effect is toward deep-hardening." By combining these two tendencies correctly, a deep-hardening, fine-grained steel can be produced.

Fig. 11 shows the hardenability multiplying factor for vanadium. With normal hardening temperatures, the hardenability decreases with increasing vanadium; when high-hardening temperatures are used, the hardenability is increased with increased vanadium. Fig. 12 shows the comparative effect on grain size and penetration in a plain carbon and a carbon-vanadium steel by increasing the hardening temperature by steps until complete through hardening of the section is obtained. It will also be noted from Fig. 12 that the presence of stable vanadium-rich carbides serves to promote fine grain size.

As an alloying element, vanadium is distinguished by its marked effect in resisting softening of the quenched steel during drawing. This effect is particularly noticeable in the range from 900 to 1200 F. The tempering curve may show a less rapid fall in hardness than similar steels having no vanadium, or a practically constant hardness on tempering over this range. When tempered at higher temperatures, the fall in hardness is relatively more rapid than in a similar steel without vanadium. So with full tempering temperatures there is little difference in steel with or without vanadium.

Vanadium finds extensive use in the tool-steel field. It is used in the plain carbon steels to make fine-grained, shallow-hardening, water-hardening steel, thus promoting toughness. It is used quite largely in the alloy tool-steel field to promote fine grain in larger masses where quenching temperatures must be raised and, because of the resistance of vanadium steels to tempering, in tools where heat is to be encountered.

It was discovered in some of the early attempts by Dr. John A. Mathews to improve high-speed steel that vanadium in amounts of 1% and less imparts remarkable cutting properties. In fact, the modern high-speed steels spring from this discovery. It has been found that the minimum content for good cutting is 1%. The "super" high-speed steels usually have about 2% and some development work has been done on steels with up to 4% vanadium. These steels are difficult to handle and special in nature.

Cobalt, which is similar to nickel in most of its properties, might be expected to act similarly as an alloying element. Actually, it does not. A few of its effects are similar; most of them are the opposite. Cobalt dissolves freely in iron and enters into solution with the iron in the carbide. The effect of cobalt on the eutectoid point is to move it toward the right: the eutectoid point in a 3% cobalt steel occurring at 1.24% carbon. Cobalt raises the transformation points on heating and cooling, forming ferritic steels in all proportions, whereas nickel in increasing amounts makes the steel austenitic. Cobalt tends to render the iron carbide unstable, causing the steel to graphitize. Cobalt has a negative effect on hardenability. Its principal use in tool steels is in the "super" high-speed steels, where it is added in quantities of 3 to 12% to standard tungsten-molybdenum high-speed steels. The customarily used percentages are 5 to 8%. Cobalt seems definitely to increase the red hardness of these steels. It finds a limited use in hot-work tools where extreme temperature conditions are encountered.

Small Metalworking Plants Have Higher Percentage of Old Equipment

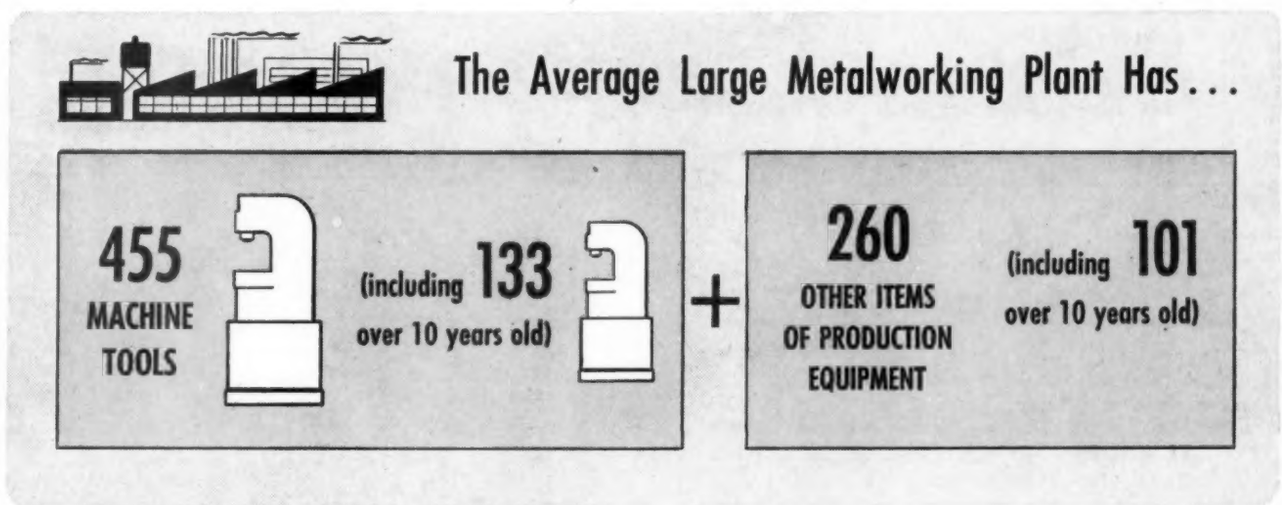
Common belief that larger plants have higher proportion of newer units substantiated by a survey. Small plants have more old tools

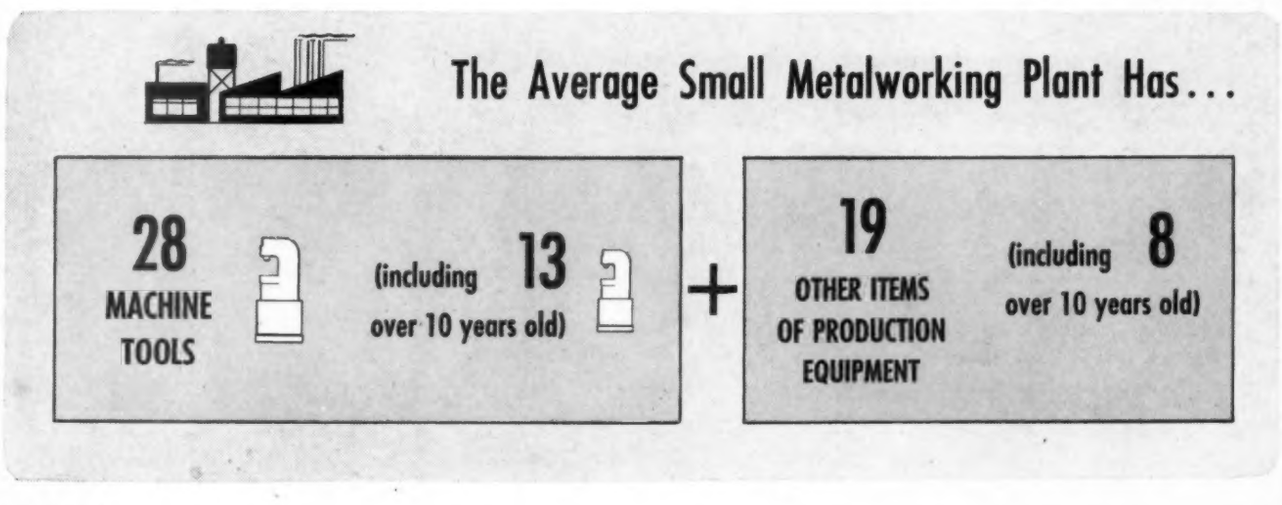
A SURVEY just completed by *American Machinist* confirms what most people in the metalworking industries have long suspected—that small shops do not have as much *modern* machinery proportionately as large shops.

By the same token, the statistical analysis gives comfort to those who feel that small shops are an excellent market for new and government-surplus machine tools and other production equipment.

To begin with, the survey shows that small plants (those employing less than 500 workers) hold 54.2% of the 645,548 machine tools over 10 years old installed in American industry, and 52.7% of the 430,914 units of production equipment more than 10 years of age—a little over half of each class. Further, 46.1% of the machine tools in small shops and 42.1% of the production equipment other than machine tools—almost half of each group—are older than 10 years. This is in sharp contrast with the situation in large plants, in which only 32.6% of the machine tools and 38.7% of the production equipment are over 10 years old—about a third on the average.

The facts at hand make it clear that small plants sooner or later must seek replacements for the 348,876 machine tools over 10 years of age that they now possess. Many small shops,





EQUIPMENT OF METALWORKING PLANTS, 1945

(Subdivided by type and by size of plant—small plants being those with fewer than 500 workers)

MACHINE TOOLS

TYPES OF EQUIPMENT	NATIONAL TOTAL			2,069 SMALL PLANTS			305 LARGE PLANTS		
	TOTAL*	OVER 10 YEARS OLD	%	TOTAL	OVER 10 YEARS OLD	%	TOTAL	OVER 10 YEARS OLD	%
Boring Machines	49,005	16,940	34.5	2,123	1,198	56.6	6,056	1,708	28.2
Broaching Machines	9,512	3,407	35.9	322	198	61.3	1,819	521	28.6
Centering Machines	3,373	1,871	55.5	146	106	72.7	614	283	46.1
Cutting-Off Machines	74,182	25,765	34.7	4,798	1,747	36.3	6,157	1,789	29.1
Drilling Machines	331,038	126,172	38.1	17,801	7,363	41.3	38,789	14,908	38.3
Gear-Cutting Machines	54,539	16,350	30.0	1,232	872	70.7	9,474	2,708	28.6
Grinding Machines	357,173	108,280	30.3	14,471	5,502	38.0	45,583	13,947	30.8
Honing and Lapping Machines	15,443	2,088	13.5	528	74	14.0	2,331	348	15.0
Keyseaters	4,434	3,193	72.0	491	374	76.2	247	162	65.6
Lathes	406,137	167,398	40.9	22,453	12,323	54.9	42,907	14,888	34.5
Milling Machines	164,929	62,861	38.1	7,501	4,345	58.0	23,297	7,553	32.6
Pipe Cutting & Threading Machines	9,923	4,975	50.0	551	343	62.3	655	278	42.4
Planers	16,054	12,662	78.9	1,526	1,278	83.7	1,306	804	61.6
Polishing & Buffing Machines	56,496	23,475	41.6	2,435	1,159	47.5	6,193	2,265	36.7
Rifling & Rifle-Reaming Machines	1,246	423	33.9	11	5	45.5	294	72	24.5
Shapers	35,549	23,275	65.5	2,933	1,940	66.2	2,954	1,551	52.5
Threading Machines (except pipe)	34,304	13,900	40.5	1,371	673	48.9	4,633	1,551	33.5
Other Machine Tools	43,130	32,513	75.4	1,329	715	54.1	5,239	2,734	52.1
TOTAL	1,666,467	645,548	38.7	82,382	40,215	48.9	198,548	68,348	34.4

OTHER PRODUCTION EQUIPMENT

Air Compressors	34,554	15,782	45.7	2,741	1,247	45.6	1,077	512	47.5
Baking and Drying Ovens	17,034	8,450	49.6	844	366	43.4	1,073	500	46.6
Bending Machines	40,323	19,037	47.2	2,022	1,005	49.7	3,770	1,470	39.0
Cranes	99,005	46,624	47.1	4,457	2,024	45.4	8,380	4,279	51.1
Forging Machines	30,000	18,612	62.0	945	759	80.3	2,324	1,306	56.2
Heat-Treating & Hardening Furnaces	54,431	16,581	30.4	2,378	835	35.1	5,978	1,772	29.6
Hoists	166,580	57,977	34.8	9,128	3,249	35.6	12,300	4,347	35.4
Oil Extracting Machines (from chips)	3,168	1,174	36.9	188	92	48.9	279	97	34.8
Parts Washing Machines	10,772	1,645	15.3	414	52	12.5	1,152	192	16.7
Plating Equipment	25,858	6,820	26.4	1,187	337	28.4	1,600	443	27.7
Presses (not forging presses)	247,333	152,352	61.6	10,876	6,449	59.3	28,861	16,125	55.8
Riveting Machines (not portable)	24,054	8,682	36.1	656	306	46.6	3,907	1,052	26.9
Shears	33,928	20,300	59.9	1,993	1,308	65.6	2,221	1,090	49.1
Swaging Machines	4,476	2,892	64.5	193	113	58.5	299	107	35.8
Tumbling Barrels	27,944	16,381	58.6	1,432	842	58.8	1,553	824	53.1
Welding and Cutting Machines	245,535	37,605	15.3	8,699	1,798	20.7	19,549	4,443	22.7
TOTAL	1,064,995	430,914	40.4	48,526	20,998	43.5	94,323	38,559	40.9

**Excluding Army and Navy Arsenals.*

not so well financed as the big plants, will seek much of their modern equipment among government-owned surplus machines. As a matter of record, they have always been active buyers in the used-equipment market.

Distribution of metalworking equipment, as indicated by the survey, is about as follows: Small plants have 757,341 machine tools, or 45.5% of the total, large plants 909,126, or 54.5%. On the other hand, small plants have 539,268 units of other production equipment, or 52.8% of the total, large plants only 525,727, or 47.2%. Thus the greater number of small plants compensates for the greater number of units in each large plant.

The average large plant has 455 units, of which 133 are over 10 years of age. The average small shop has 28 tools, of which 13 are more than 10 years old. The average large plant also has 260 units of production equipment other than machine tools, 101 of which are over 10 years, while the average small plant has 19 such units, of which 8 are more than 10 years old.

Results of the survey are based on complete figures furnished by 2,374 metalworking plants. Of the total, 305 fall within the classification of large plants and 2,069 of small plants. These plants have 17% of the nation's machine tools and 13% of production equipment other than machine tools, excluding Army arsenal and Navy Yard holdings.

NATIONAL DISTRIBUTION OF PRIVATELY OWNED METALWORKING EQUIPMENT BY SIZE OF PLANT

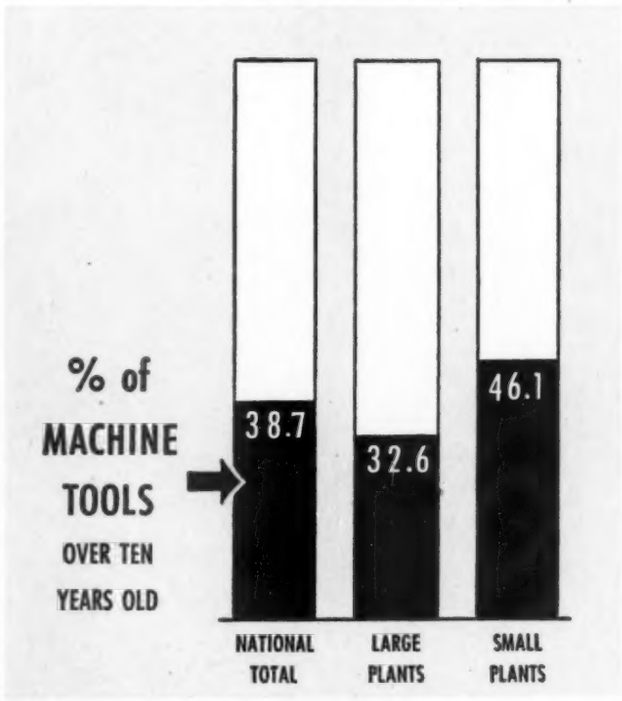
	Total	% of Total	Over 10 Years Old	% Over 10 Years Old
MACHINE TOOLS				
27,343 Small Plants	757,341	45.5	348,876	46.1
2,017 Large Plants	909,126	54.5	296,672	32.6
Total	1,666,467*	100.0	645,548	38.7
OTHER PRODUCTION EQUIPMENT				
27,343 Small Plants	539,268	52.8	227,480	42.1
2,017 Large Plants	525,727	47.2	203,434	38.7
Total	1,064,995	100.0	430,914	40.4

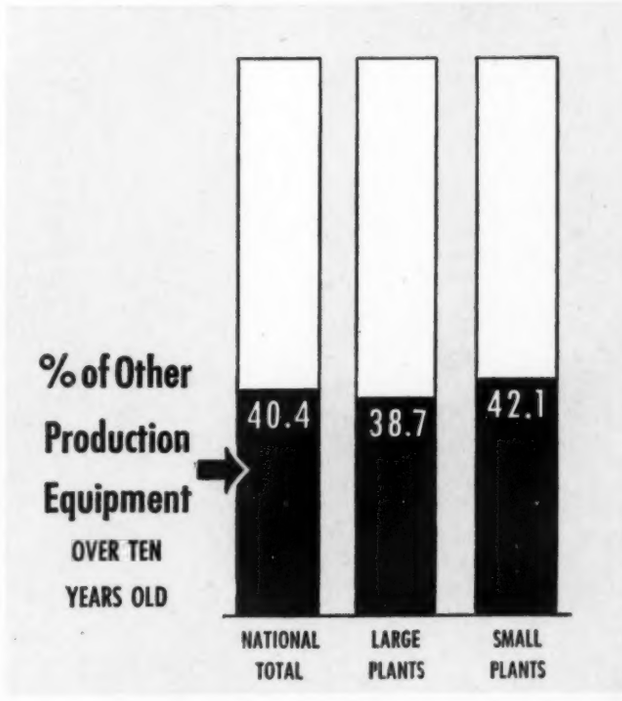
Source: American Machinist *1945 Inventory of Metalworking Equipment, excluding Army and Navy Arsenal equipment. These national data has been adjusted to show the relative equipment holdings by size of plants.*

RESULTS OF AMERICAN MACHINIST SURVEY OF 2,374 LARGE AND SMALL PLANTS

	Total	% of Total	Over 10 Years Old	% Over 10 Years Old
MACHINE TOOLS				
2,069 Small Plants	82,382	29.3	40,215	48.8
305 Large Plants	198,548	70.7	68,348	34.4
Total	280,930	100.0	108,563	38.3
OTHER PRODUCTION EQUIPMENT				
2,069 Small Plants	48,526	34.0	20,998	43.3
305 Large Plants	94,323	66.0	38,559	40.9
Total	142,849	100.0	59,557	41.7

Relative Equipment Obsolescence Nationally in Large vs. Small Plants





Give the Foreman Schedule Responsibility

BY FAREL A. H. HULICK, CHIEF METHODS ENGINEER, SIGNODE STEEL STRAPPING COMPANY

Production control at Signode is based on the shop man—the man who does the work—not on chasers and expediters

IN MANY PLANTS, the philosophy of production control, boiled down, amounts to this: "Because Production Control sets up schedules, assigns work, and keeps chasers after orders, it should take the blame when schedules are missed." If all facets of manufacturing management are given searching analysis, an entirely different concept will emerge: "The logical person on whom to place final responsibility for getting work done is the man who does the work."

Procedures evolved at the Signode Steel Strapping Company follow out this line of reasoning. If manufacturing is to be done at a maximum profit level, these are fundamentals:

Inventories of finished goods, work in process, and raw material must be controlled so there is always enough, but never too much.

Normal capacity of the shop must be determined, and work loads assigned so each man and machine is loaded to that normal capacity.

Fluctuations in loads on each man, machine, department, and the plant as a whole must be predicted far enough in advance to prevent overloads and underloads.

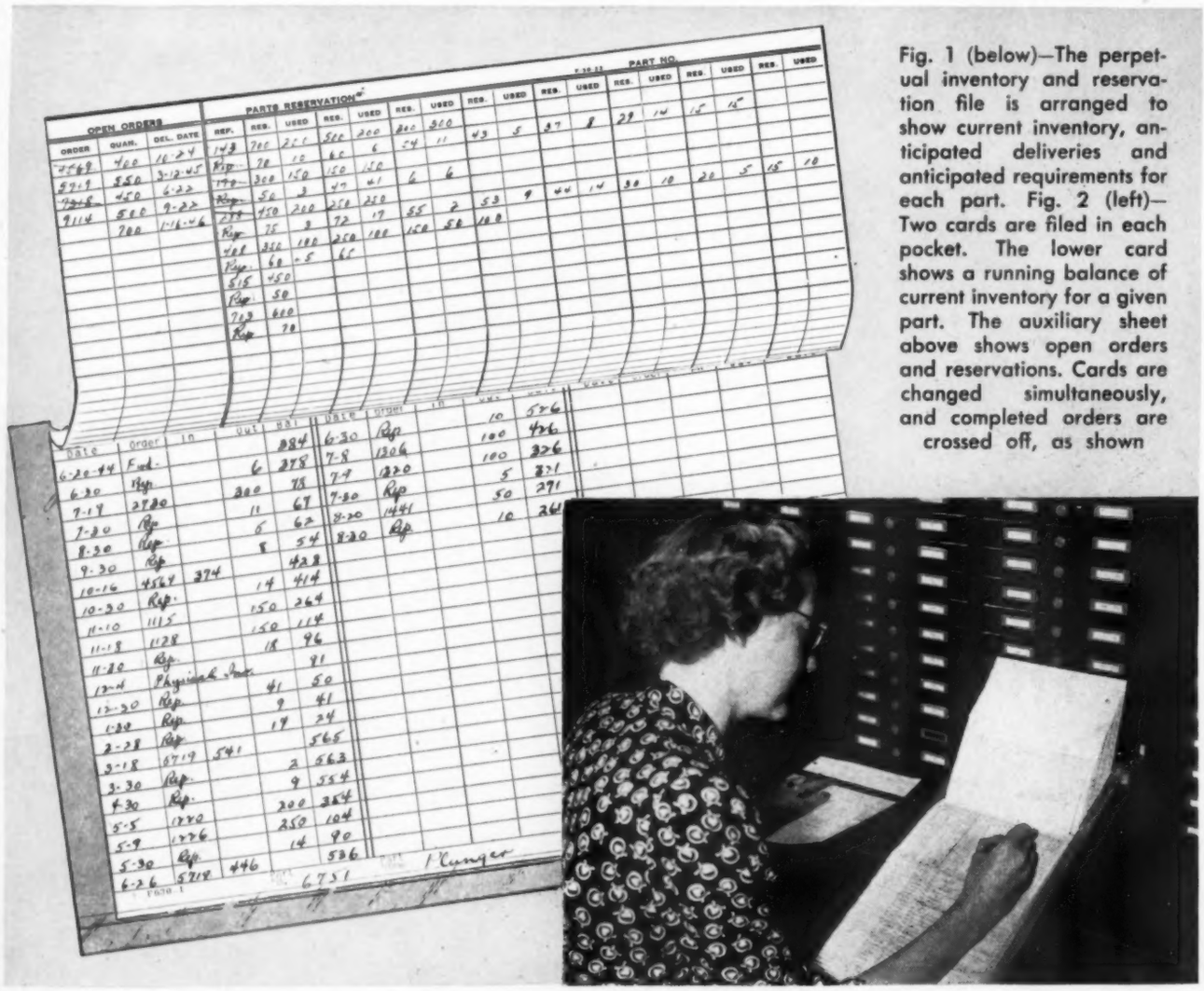


Fig. 1 (below)—The perpetual inventory and reservation file is arranged to show current inventory, anticipated deliveries and anticipated requirements for each part. Fig. 2 (left)—Two cards are filed in each pocket. The lower card shows a running balance of current inventory for a given part. The auxiliary sheet above shows open orders and reservations. Cards are changed simultaneously, and completed orders are crossed off, as shown

Fig. 3—Production-control center in the factory office has wall-board visual records of work to be completed during each week. The clerk in the foreground posts operation completion data in open-order record books at her left

The cost of operating this plan is low. At Signode, all detail work—planning, determining order quantities, scheduling, determining raw-material quantities and the dates required, loading machines, issuing shop orders, issuing schedules, keeping inventories of raw material and finished goods, computing and reporting shop performances to standard, and computing and reporting schedule performances—are performed by four girls. The physical equipment consists of a perpetual inventory file, the weekly schedule boards by which the machines are loaded, and a register of open shop orders.

Because of the wide variety of types and sizes of strapping tools required, many custom-built shop-order quantities range from several thousand pieces down to one. Yet, Signode completes 90 to 95% of the standard hours on its weekly schedule; man and machine capacities are fully utilized, and inventories are kept at the minimum consistent with economical operation and current and potential requirements.

Every person in the organization has a contributory responsibility for insuring that schedules are met, but the foremen and workmen on the line must finally execute the work to meet schedules. The foreman, therefore, must take final responsibility for meeting schedules and must have the necessary authority.

Foremen Are Interdependent

The foremen in the various machine-shop departments are more or less interdependent on each other. If later operations are to be completed on schedule, earlier operations must be started and completed in time. As a result, each is more or less responsible for the schedule as a whole, rather than only those operations which are done in his own department. Unless each member of the team does his share, even the performance of those who did their share, or more, is wasted. So the schedule must be considered as applying to the shop as a whole rather than to individual departments.

For a shop to meet a schedule, it must have a schedule that can be met, predicated on the materials, machines, tools, and men available. Schedules must be based on the current man-hour and machine-hour capacity and that capacity is seldom the number of hours that show on the clock or time cards. Rather, capacity is that number of standard hours of work which experience shows can normally be expected to be produced in a given work center.

Take for example, a group of four polishers. If one is experienced and consistently produces 66 standard hours of work per week if two are average and produce 60, and if one is green and just breaks even at 48 standard hours per week, then average total work produced by the group is 234 standard hours per week. When the green man becomes more experienced, capacity will increase. If the best man leaves, capacity will decrease.

Many factors keep departmental and work-center capacities in a constant state of change. The changes may be up or down; they may be

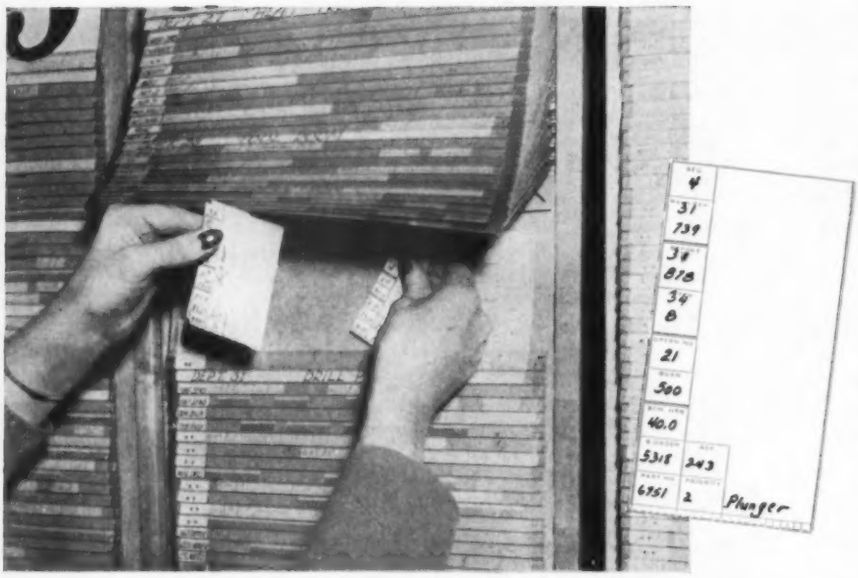


Fig. 4—The dispatcher places schedule tickets (insert), cut to lengths corresponding with hours, in the machine-center schedule boards on the office wall to reserve machine capacity required for each operation on a given order. Each machine is represented by a separate pocket on each of the weekly schedule boards. Visible scheduling of the load ahead for each machine makes it easy for each foreman to plan work in his department to best advantage

sharp or gradual. However, regardless of the direction or rate of the change, there is a change and it must be recognized to avoid overloading or failure to take full advantage of a currently increasing capacity. Equipment troubles, labor turnover, model changes, frequency of setups, seasonal variations, shift differences, and material variations are among the factors which the scheduler must consider if reasonable schedules are to be assigned.

Standard hours for scheduling may be determined in any of several ways. The time study for wage-incentive payments is best. Synthetic studies from standard data or observations on actual operations will work, provided the time-study man understands levelling performances and applies the proper delay allowances. Lacking competent time study, a good job can be done with records of previous performances. But, the method used to determine standard hours must reflect the true picture of the amount of work involved on every operation. Unless that is true, the work-load picture will be distorted. It does not matter if standard hours are materially different from actual hours. The important thing is that the standard hour used to schedule one job represents the same amount of work as the standard hour used to schedule another job. The standard hours must be a common denominator for all jobs in a given work center.

Control of production begins with a sales forecast. It tells what will be needed, when, and the quantities of each model and size required. This forecast is subject to revision but usually is reasonably accurate. Quantities of individual parts are determined from this forecast and assembly lists for each model and size. These quantities are then reserved on auxiliary card sheets in a visible-index perpetual inventory file, Fig. 2. At the same time, the inventory card is scanned to determine how many parts have been withdrawn for field repairs, and reservations made to allow for them.

The quantity of parts to be manufactured is determined by adding the current inventory to any orders in process and subtracting from the sum the total reservations. Of course, the reason for including repair parts with parts for assembly is to avoid the cost of running a separate order for repairs.

Reservation of raw material is made the same way, except that all material for the order is reserved in one lump without any attempt to segregate that portion which will go into parts for field repairs.

The next step is scheduling work into machines. Man and machine capacity is reserved on visible-index card pocket panels. Each panel represents one week, Fig. 3. A card showing the week-ending date is placed in the top pocket and each pocket below it represents the capacity of one work center for that week. The description of the work center (machine number or a description of the work done) is shown at the left-hand side of the pocket.

Schedule tickets (10 in. or 100 hr. long), Fig. 4, are cut to a length which represents the number of hours required for the respective operations. A scale graduated ten to the inch is printed on them to facilitate cutting. (Spaces for written data are repeated across the ticket so four operations of 25 hr. or less, or two operations of 50 hr. or less can be made from one blank ticket.) Near the ticket bottom is a perforated line, and below it the ticket is printed in a solid color which indicates that although the operation has been scheduled and capacity reserved for it, the material is not yet in the plant, and the shop order has not been issued. When material is in and shop order issued, this strip is torn off, thus showing white instead of color on the bottom ⅜ in. visible in the index file.

The schedule tickets are written from method sheets, Fig. 5. They show the sequence of departments and operations, the machine number, speeds and feeds, and standard hours per hundred pieces for each operation. This information is the result of an analysis of all possible methods of making the part with the equipment available, and synthesizing that analysis into the most economical method that will produce the parts to the required quality.

Information Entered

All information that will be needed for machine loading and scheduling is entered on the tickets, and, with the exception of the shop-order number, this includes all information needed for issuing the schedule to the shop. It consists of the serial number of the individual operation in the manufacturing sequence (if there are ten operations to be done, there are ten schedule tickets), the Machine Center for that operation, preceding and succeeding Machine Centers, the Order quantity, the standard hours for the operation (order quantity multiplied by the standard hours per hundred, from the route card), the Shop Order No., Part No., Reference No. (the lot to tools into which these parts will be assembled), Part Name, and the Priority No. The Priority No. is the day of the week (Monday is 1,

Tuesday is 2, etc.) on which the operation should probably start in order to be completed in time for succeeding operations to run on schedule; it is entered on the tickets as they are placed in the boards. Of course, a reasonable amount of time is left between operations and between final inspection and assembly to take care of minor delays.

In this example it has been assumed that, with the exception of heat-treating, space has been available wherever needed. This will not always be true, so it may be necessary to look farther ahead for required machine capacity, or to adjust the schedule on other parts to provide necessary capacity. Either is relatively easy, as any available capacity is readily visible, and if adjustments are necessary it only involves moving the tickets and changing the priorities on them.

Many Variations Possible

This method of scheduling has possibilities of infinite variation. On large orders where there are several long operations, two or more operations may be scheduled to run simultaneously. Where operations are short, setups are readily made, and physical movement is of no moment, several operations may be scheduled to run in one day. In a continuous type of manufacturing, only the "key" or "bottleneck" operations need be scheduled because other operations have been balanced to fit the critical stations.

After an order has been scheduled in this way, the schedule is certainly attainable as no machine or department can be overloaded. The length of the pockets and the number of pockets represents the capacity of each machine center. When they are full, each one has a reasonable load, and there is no place to put more work.

Having the machine load visible is very useful in forecasting fluctuations, weeks or months ahead. It tells where and when fluctuations will occur and how much they amount to so necessary adjustments may be made.

Most orders are scheduled to meet a specified assembly date. Starting with the last operations and working back to the first assures that no work is done before it is needed. This keeps the work-in-process and finished-parts inventory to a minimum; it gives maximum leeway for procurement of material; and in the case of new parts, gives the maximum time for making necessary tools jigs and fixtures. The Tool Room is given a schedule of the date when each tool will be needed.

When material has passed receiving inspection, a shop order is issued, colored strips torn off the schedule tickets, and the shop-order number entered on them. Material and order are not released to the shop, however, until the order is scheduled to start.

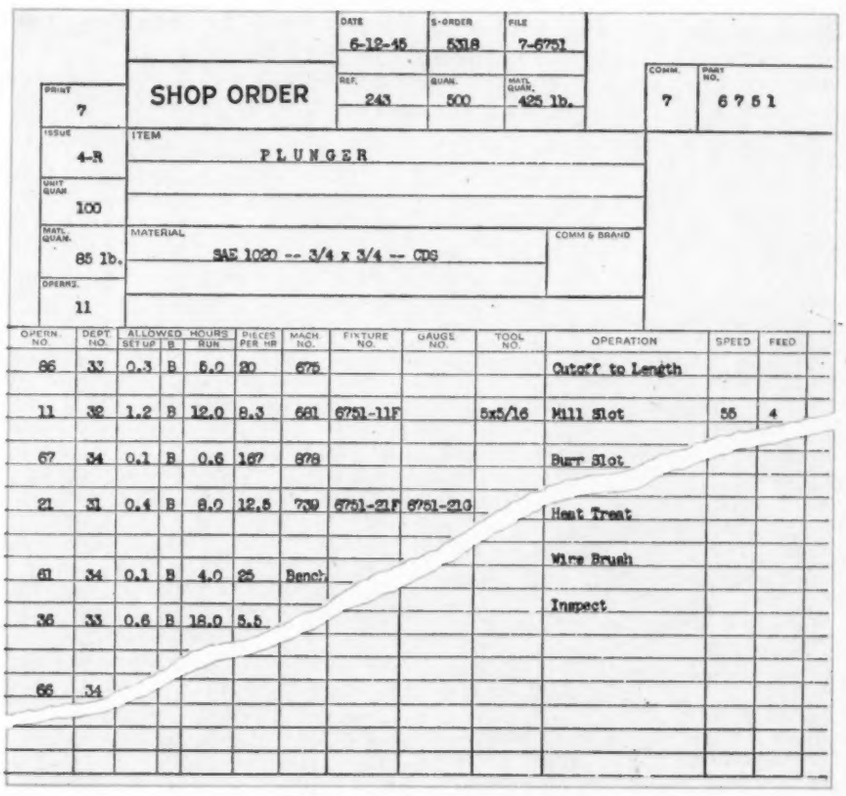
The shop order has all instructions necessary to manufacture the parts. One copy is furnished for each operation on the order. Each copy has a complete specification for department and operation sequence, "setup" standard hours, "run" standard hours per hundred, the machine number, standard pieces per hours, and the special jigs, fixtures, and gages, operator instructions, and speeds and feeds for each operation. If, while the order is in process, the shop wishes to make any change in manufacturing method, they notify the Methods and Standards Dept., so the change may be recorded and the variation from standard cost charged to the function responsible for it.

Each foreman runs his own department. There are no order chasers or expediters. He assigns the jobs to specific machines and assigns operators to work on them. The methods engineers determine the operation sequence, the machine, and the speeds and feeds which are most economical, and shows them on the shop order. Production Control decides what jobs are needed and the sequence in which run. The foreman may change operation sequence, machines, speeds, feeds, and starting dates whenever necessary, but usually any major changes are sure to be reflected in increased costs, reduced quality, or delayed operations.

Advance Release Harmful

Releasing orders too far in advance causes trouble. Some jobs get ahead of schedule, others get behind, jobs become urgent, others may have to be cancelled, and adjustments must be made in machine loads to compensate. Furthermore, if the shop is given too much long-range latitude in choice of jobs they may not work them in the proper sequence to produce parts needed for final assembly or to prevent succeeding departments from being choked or starved.

The schedule is published weekly. On Friday each department receives its schedule for the succeeding week, and the foremen begin to plan their work. On Monday, Wednesday, and



SHOP ORDER

DATE 6-12-45 | S-ORDER 5518 | FILE 7-6751

REF. 243 | QUAN. 500 | MATL QUAN. 425 lb.

COMM. 7 | PART NO. 6751

PRINT 7 | ISSUE 4-R | UNIT QUAN 100 | MATL QUAN. 85 lb. | OPERNS. 11

ITEM: PLUNGER

MATERIAL: SAE 1020 -- 3/4 x 3/4 -- CDS | COMM'L BRAND

OPERN. NO.	DEPT NO.	ALLOWED HOURS SET UP	B	RUN	PIECES PER HR	MACH NO.	FIXTURE NO.	GAUGE NO.	TOOL NO.	OPERATION	SPEED	FEED
86	33	0.3	B	5.0	20	675				Cutoff to Length		
11	32	1.2	B	12.0	8.3	661	6751-11F		5x5/16	Mill Slot	55	4
67	34	0.1	B	0.6	167	678				Burr Slot		
21	31	0.4	B	8.0	12.5	739	6751-21F	6751-21G		Heat Treat		
61	34	0.1	B	4.0	25	Bench				Wire Brush		
36	33	0.6	B	18.0	5.5					Inspect		
66	34											

Fig. 5—One copy of each shop order is made up for each operation shown. These copies are delivered to the foremen interested in the order and give all needed data for the work required

Friday, short meetings are held in the Plant Manager's office to discuss the progress of the work on the schedule. Each foreman is quick to sense a job that looks like it may be late and none are bashful about asking to have it on time. On the other hand, if a job is not going well, one foreman may ask the others to make arrangements to receive the job late and give it special handling.

Any operations not completed in the week scheduled automatically become a part of the schedule for the following week. This can cause a serious overload if permitted to build up, so on Wednesday afternoon each foreman turns in a list of operations he thinks may be missed. These are rescheduled for the following week, and work load is adjusted accordingly.

Having jobs rescheduled does not cancel them from the current-week's schedule. If they are missed, they will be reported as delinquent regardless of whether they are rescheduled. This rescheduling procedure has two important effects. It keeps carry-over to a minimum, and it focuses the attention of the Superintendent and foreman on trouble jobs so they frequently receive special attention and can be picked up before it is too late.

The average schedule performance is well over 90%, with an occasional 97, 98, 99%, and rarely below 85%. This would not be possible if everyone in the organization did not fulfill his responsibility. The line cannot function if the staff fails. There must be dependable tools; there must be adequate equipment; the materials must be available; there must be every one of those things and services which the foreman needs.

Schedule For Week Ending 8/18/45 Dept. 32 - Milling

Part No.	Order No.	Priority	Part Name	Quantity	Dept. Before	Operation Number	Dept. After	Schedule Hours
1674	8385	2	Eccentric Shaft	1666	M	11	33	13.8
2501	7836	Any	Sealer Jaw	1275	31	15		85.0
2571	7838	Any	Sealer Jaw	1150	31	12		85.0
3050	7753	1	Chair Blank	880		12	34	62.0
3088	7463	5	Latch for Gripper	2750	34	11		23.9
3090	8221	Any	Chair Blank					
4461	5848	Any	Stud for Seal Pad					
4518	7377	3	Plug for Gripper					
4568	8210	3	Sealer Handle					
4573	7534	Any Any	Sealer Jaw Support					
5901B	7978	1 2 3 4	Base					
5912	7981	1	Gripper Shaft					
5985	8296	5	Rack					
6172	7864	Any Any Any Any	Chair					
6252	7868	Any Any Any	Toggle Link					
6253	7869	2 2	Handle Link					
6258	8073	6	Side Plate Fork					
6583	7870	3 4	Forming Pin					
6758	8230	3 4 5	Gripper					
6931	7755	Any	Handle					
7381	6589	Any	Gripper					

FIG. 6

Fig. 6—A schedule sheet is made up weekly for each department to show the work to be done. It constitutes the foreman's authority to put the work in progress and imposes the responsibility to see that the work listed is done

DAILY DEPARTMENTAL PERFORMANCE REPORT Week Ending 6-9 Dept. Name Milling Dept. No. 32

DIRECT LABOR HRS.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.	Total
Productive	121.1	138.3	138.8	135.0	115.0	103.7		751.9
Unpredictable	–	–	–	–	–	–		–
S.M.	–	–	–	–	–	–		–
M.O.	–	–	51.1	2.1	–	–		7.2
Other	–	–	–	–	–	–		–
TOTAL	121.1	138.3	143.9	137.1	115.0	103.7		759.1
INDIRECT LABOR HRS.								
Supervision 02	8.0	8.0	8.0	8.0	8.0	–		40.0
Rework & Salv. 24,26	6.7	–	–	1.8	3.5	7.4		19.4
Idle 17,18	1.4	2.0	3.7	3.4	1.7	2.1		14.3
Housekeeping 06	–	–	–	1.8	–	2.0		3.8
Training 07	0.9	0.4	0.5	1.0	–	–		2.8
Repairs 28,29,30	11.2	7.3	10.8	9.7	9.5	12.7		61.2
Lunch & Rest 16	–	2.4	2.3	2.4	6.1	2.5		15.7
Clerical 04	–	–	–	–	–	–		–
Material Handling 05	–	–	0.2	–	–	–		0.2
Process Insp. 08	–	–	–	–	–	–		–
Other	–	–	–	–	–	–		–
TOTAL	28.2	20.1	25.5	28.1	28.8	26.7		157.4
CONTRIBUTORY LABOR HRS.	64.9	76.0	70.4	74.9	67.7	53.0		406.9
TOTAL ACTUAL HRS.	214.2	234.4	239.8	240.1	211.5	183.4		1323.4
Allowed Hrs. on Bonus Stds.	182.7	203.9	206.6	194.4	170.3	148.6		1106.5
Actual Hrs. on Bonus Stds.	127.8	136.8	143.9	138.9	118.5	111.1		777.0
D.W.G. Hrs. on Bonus Stds.	0.4	–	0.2	3.9	1.0			5.5
Performance on Bonus Stds.	143	149	144	140	144	133		142
Allowed Hrs. on Non-Bonus Stds.	–	4.9	–	–	–	–		4.9
Actual Hrs. on Non-Bonus Stds.	–	1.5	–	–	–	–		1.5
D.W.G. on Non-Bonus Stds.	–	3.4	–	–	–	–		3.4
Performance on Non-Bonus Stds.	–	330	–	–	–	–		328
Total Dept. Perf. on Stds.								
Contributory Ratio	.38	.37	.35	.40	.32	.38		.38
Contributory Bonus Per Cent								38.4%
Act. Hrs. on Scheduled Work	117.5	138.3	134.7	135.0	115.0	99.9		740.4
Act. Hrs. on Non-Scheduled Work	3.6	–	9.2	2.1	–	3.8		18.7

Operations Scheduled	30	Carry Over	3	Total	33	Std. Hrs. Scheduled	965.1	Carry Over	46.9	Total	1012.0
Operations on Schedule Completed					30	Standard Hours on Schedule Completed					974.3
Per Cent of Operations on Schedule Completed					91%	Per Cent of Standard Hours on Schedule Completed					95%

FIG. 7

Fig. 7—The daily departmental performance report is on the factory manager's desk by noon of each day, showing him a detailed breakdown of the performance of each department for the preceding day

"Tree" Stores Plug & Ring Gages

BY LOUIS deL. BERG

AS KEPT ORIGINALLY on shelves, each pair of go and not go setting plugs was fitted with handles. A great deal of room was taken up by the handles alone, as plugs ranged from No. 4-40 with a No. 00 taper-lock handle to 5 in.-16 with a No 7 "tri-lock" handle. Unless the gages were individually boxed or separated by partitions, it was likely that threads would be struck and damaged.

To save space and insure safe storage of setting plugs, a stand with three revolving shelves was made. The plywood shelves, ¾ in. thick by 24 in. in diameter, were fitted with 1½-in. pipe flanges bored out to be a sliding fit on the file-finished 1½-in. pipe column.

Each of the shelves was made to hold setting plugs of a specific range of sizes. The lowest shelf, No. 1, held all of the large plugs that had been fitted with tri-lock handles. The handles were removed for two reasons: (1) to save space, and (2) it was found that in most cases it was easier to fit ring gages to setting plugs without handles. Nevertheless, a pair of No. 6 and No. 7 tri-lock handles with locking screws were kept alongside the stand for use when desired.

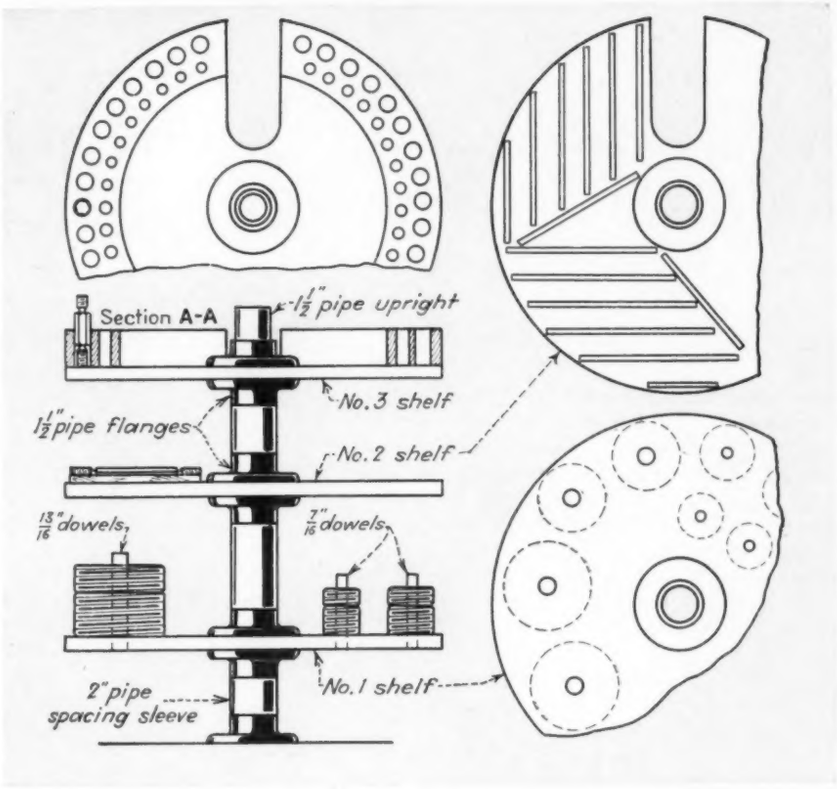
Wood dowels were glued into holes in the lowest shelf for the purpose of holding pairs of go and not go setting plugs. These dowels were placed far enough apart to prevent adjacent plugs from coming in contact. Dowels of 7/16-in. dia. were used to hold plugs between 1.510- and 2.510-in. pitch dia., and 13/16-in. dowels for larger.

As the taper lock handles are used with gages of less than 1.510-in. pitch diameter, the plugs were left in the handles. The middle, or No. 2 shelf, held the larger sizes, which were laid flat and separated by wood strips ⅜ in. wide by ⅝ in. high. The top, or No. 1, shelf, was reserved for plugs using taper-lock handles of the No. 3 size or smaller. They were placed vertically in holes drilled in a circular wood rim measuring 2½ in. high by 3 in. wide, as shown at top left above.

Notches were cut in the top and middle shelves to give more room when removing a setting plug from the shelves below.

All holes, partitions and dowels in the shelves were numbered consecutively, starting from the smallest hole in the top shelf. A sheet was then drawn up like the form in the accompanying table, and the setting plugs were listed according to ascending size. Each plug was also given a numbered label, corresponding to the number of the hole or pin to which it was assigned. This practice facilitated replacement of the plug in its proper place without reference to the list.

The stand provided room for considerably more sizes than were on hand at the time it was built. Therefore, gaps were left at appropriate intervals, and there were filled when new sizes were received. In practice, it was found that the stand kept the plugs in neater arrangement and that selections could be made quickly and without damage to others.



When storage room for master gages became overcrowded, this stand was built to hold setting plugs for thread ring gages

FORM USED IN LISTING THE SETTING PLUGS

Label No.	Nominal Size	Symbol	Pitch Diameter		Date Checked	Remarks
			Go	Not Go		
1	#4-40	NC-1	0.0958	0.0934		
2	#4-40	NC-3				Not furnished
3	#6-32	NC-2	0.1177	0.1150		
4	#6-32	NC-3	0.1177	0.1158		

When a plug of standard size was not on hand, the pitch diameter column was left blank. This indicated to the man in charge of gage control that the setting plug should be ordered if there was a ring gage of that size.

A Little Can Go a Long Way

BY BENJAMIN MELNITSKY
FORMERLY STOREROOM FOREMAN,
WATERBURY TOOL CO., DIV. OF VICKERS, INC.

Short ends of bar stock should not be rashly created, discarded, or stored. A good order, control and handling system is offered based on the author's experience

SHORT ENDS of bar stock are often relegated to the scrap pile and accepted as an inevitable materials cost. If they are saved, without provision for their use, subsequent recording and storage costs may cancel any material savings and economy. Constructive control of short ends indicates that:

1. Short ends should be eliminated wherever possible.
2. Those which do accumulate should be utilized.

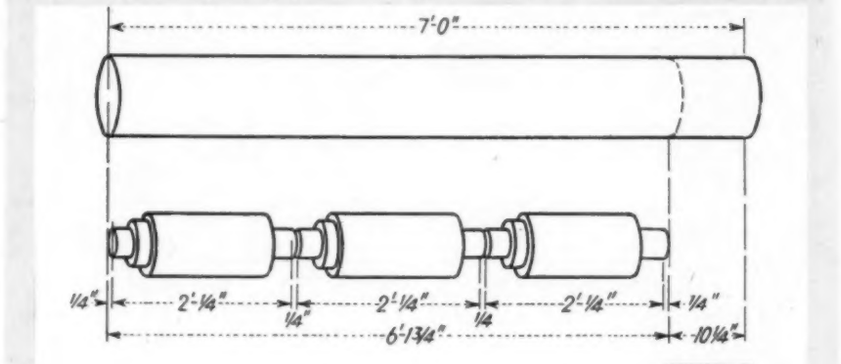
Eliminaton of short ends of bar stock is the fundamental result of good bar-stock control. Where long parts are to be made and production requirements are known, bar stock may be bought in definite lengths, from which an exact number of parts can be made. If the methods sheet shows that the bars are to be sawed in 17¼-in. lengths before machining, stock should be ordered in lengths such as 7 ft. 3 in., 8 ft. 9 in., 10 ft. 3 in., 11 ft. 9 in., 14 ft. 9 in., 15 ft. 3 in., etc., allowing ⅛ in. for each saw cut. If the same part is to be machined in a bar lathe, 3 in. should be allowed for parting-off and facing each cut. The maximum capacity of this lathe should be used for minimum waste, as the same amount of chucking grip is required for long as for short pieces.

If such close estimating is not feasible, or if purchasing bars cut to exact lengths is too costly, bars should be bought in random lengths and cut to length at the saws for each order of long parts. When the number of parts are known, there will be no such shortages as occur when bars are delivered according to footage.

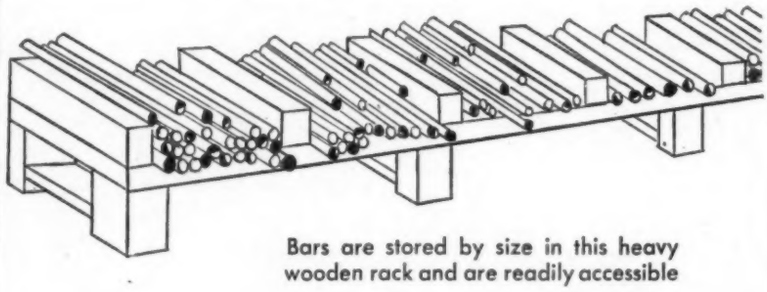
Bars of equal length should be used in automatic screw machines and multiple-spindle lathes. When unequal lengths are used, the machine would have to run with only one spindle feeding stock in order to use the last and longest bar. Cutting to length at the saws eliminates this.

In the ideal storeroom for every size and type of bar stock, all bars in the rack except one should be in full lengths. This is possible if stores personnel use uncut bars only after all partially cut bars are delivered. No matter how many bars must be cut or how many saws used, there should never be more than one partially cut bar left after the cutting is finished.

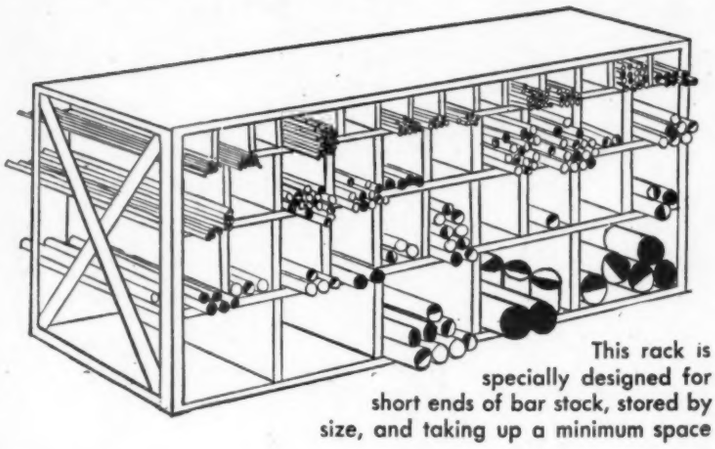
As an example, assume that 1500 flanges, each 1⅞ in. long, are ordered using 12-ft. bars and allowing ⅛ in. for each saw cut. Twenty bars and a part of a bar will fill the order. However, if six bars are used on each



Three parts, each 24¼-in. long, may be made from a 7-ft. bar. Spacers are made from the 10¼-in. bar which is left over



Bars are stored by size in this heavy wooden rack and are readily accessible



This rack is specially designed for short ends of bar stock, stored by size, and taking up a minimum space

of four saws, 24 2-ft. bars will remain. If six bars are placed on two saws and four bars on the other two saws, all 20 bars will be completely utilized. The first two saws produced 432 flanges each, the second two produced 288 each and the remaining 60 flanges can be cut from the last bar—leaving only a 2-ft. bar instead of 24 such bars.

Another means of eliminating short ends is to run two jobs through the shop at one time, one job for long parts and the other for short parts, each of the same type and size. What is left over from the long parts is used for the short parts. When sawed-to-length forgings are run through the shop the butt ends can be used in fabricating small parts.

Handling Short Ends

At one time, all short ends of bar stock in the steel room of a large New England manufacturer were inventoried and charged off individual card balances. Bars were considered as "scrap" only if within the limitations of the accompanying chart. Thus, charging off short ends was controlled and limited to definite lengths for each size of bar stock.

Following this the short ends were placed in racks so designed that they were ready and accessible.

To prevent further accumulation of short ends in the regular rack, short ends were charged to the job that produced them. If material for a job weighs 75 lb. and the left-over end 15 lb., a total of 90 lb. is charged against the job and the end placed in the scrap rack. Should the length of this end be greater than the length of scrap for the sizes listed on the chart, the material is replaced in the rack and not charged against the job. Steps are taken to maintain identity of material in the scrap rack, and if it cannot be identified it is discarded.

CHARGING OFF SCRAP BAR STOCK

Size of Stock, In. Round, Square, Hexagon	Minimum Charge-off, Ft.
1	3
1 1/16-2	2 1/2
2 1/16-3	2
3 1/16-3 1/2	1 1/2
3 9/16-4	1
4 1/16 up	1/2

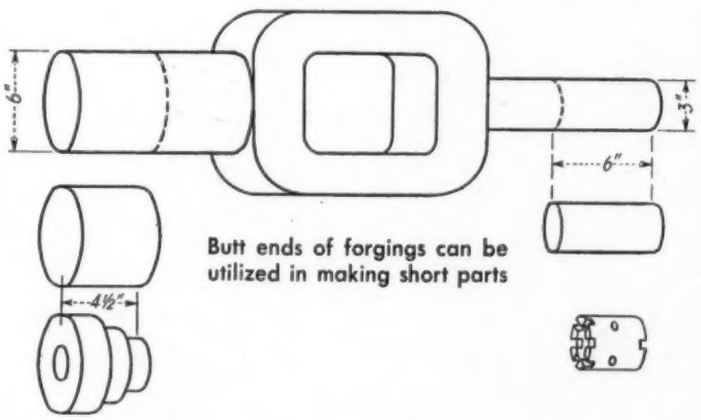
Use same chart for flat stock—go by smallest dimension.

When scrap is used to fill an order, the requisition is clearly marked so those posting it will know it is filled with material already charged off the records. The requisition may be posted on the regular card for size and type of material in such a way that it will be apparent that the material was not taken from the regular stock.

Utilizing Short Ends

Once the technique for handling such material has been established, all short ends may be utilized to the maximum degree. Material for tools, jigs, fixtures, stock for test setups, bar stock maintenance work and any non-productive jobs should be taken from the scrap whenever possible. This is important where bar stock is allocated and purchased in accordance with periodic production requirements. Excessive withdrawals of stock for other than production work may seriously distort allocation records and result in shortages for certain parts.

If every order reaching the storeroom is first checked against material in the scrap rack, an amount of scrap may be used for regular production orders. Scrap machined parts should be returned to storeroom, where the machined areas can be sawed off and the clean stock saved. Obsolete parts, cancelled parts, discarded tools, obsolete forgings and anything that has clean stock and can be identified as to type material may be sent to the saws for salvage and storage in the scrap rack. A scrap system, rigidly followed, saves much paper work because material in the scrap rack is charged off the record.



Butt ends of forgings can be utilized in making short parts

Four Steps to Foremanship

BY DAVID T. ARMSTRONG

SIDEWORD TO PRODUCTION EXECUTIVES

Successful management is dependent on efficient shop-operating supervision. Here are fundamental requirements for your potential foremen

WHILE NO FOREMAN can expect to do all that his vision indicates as desirable, he can by intelligent and forceful supervision do much to improve the manufacturing process in all its ramifications. Four basic principles of supervision cover the important points and suggest the minor items by implication.

I. Teamwork

To unify his corps of workers into a team, all working with intelligent cooperation to achieve the same general goals.

Like any other group, workers in America are highly individualistic. The idea inherent in democracy, the educational process in the schools, and the entire system of training men and women to take their places in industry all tend to make them so. The organization and administration of modern industry is also a contributing factor. One man is a toolmaker, another is an electrician, a third is a refrigeration-plant operator, a fourth is a clerk. Each worker has his own sphere of activity, yet they are all expected to seek the same general manufacturing goals. Teamwork will be achieved only when the foreman keeps these goals uppermost in his own mind and constantly before the attention of his helpers. He must encourage each to direct all his activities toward achieving these goals. It is further his duty to keep workers informed of the plans and contributions of other workers in the department, because this stimulates inter-worker cooperation and generates respect among fellow workers.

One of the most disintegrating influences in modern industry is the absolute ignorance and consequent disrespect some workers have for other employees in different fields of specialization. Just such an attitude created a bottleneck in a large welding plant recently. The only product in one department was boilers of the 30- and 60-gal. type. The man who inserted the bottoms either never had gained or had lost sight of his place in the manufacturing process. As a result, the boilers which left the seam welder to go to him began piling up. The welders who had to run a bead on the bottom insert worked on a piecework basis and were not getting a sufficient supply of boilers because this one worker evinced a careless and indifferent attitude. The galvanize-dip men were held up because of a lack of flow of boilers to them and the pressure testers were sitting around not producing. There was Hell to pay when a dozen men started hollering at once.

The foreman was at fault in not sensing this situation soon enough, also in not making clear to each man his part in the total process. Incidentally, few men are ever informed of their place in the total manufacturing process. They are left to catch on by themselves. Therefore, it seems self-evident to say that for a plant to function effectively the workers must have the same general manufacturing goals and solve their problems with mutual respect for one another, both leading to closer correlation, integration, and cooperation.

II. Proper Placement

To discover the work at which each individual is most successful and in which field he is capable of the greatest growth.

The highest achievement of an individual is effected more by the capitalization of special strengths than by the building up of discovered weaknesses. Every worker is weak in some respects, and, although he can be helped to overcome some of these deficiencies he is not likely to be outstandingly successful as a result of growth traceable to the building up of his weak points. For example, a worker deft with his hands and not too good at figures will make a better assembly worker than he will a clerk. Spending time making him a clerk will make him a better clerk than he would have been, but it will not compensate for the loss of time and money that would have been saved had he been put on assembly.

To a broad generalization of this type there are exceptions, of course. The training program of the last few years has accentuated the flaws in it, but the fundamental point that every worker has peculiar strengths and aptitudes, the direction and development of which will make him of greatest possible value to modern industry, is based on the commonsense concept that one developed strength is worth a dozen improved weaknesses.

It is, therefore, a prime responsibility of a foreman to discover which talents each worker possesses or in which manufacturing processes he has the greatest potentialities for growth and, on the basis of this knowledge, to make his assignments to provide maximum opportunity for the growth and development of these abilities and capacities. Quite frequently, workers are not aware of their abilities which may be discovered by a penetrating and experienced observer. When they are properly led to appreciate their own power and possibilities, they usually feel a consequent ambition and responsiveness to such help as the foreman can give them. In the presence of special capabilities, the foreman has both an opportunity and a challenge not only to encourage and find a proper place for the worker, but also to provide stimulation and direction to encourage the employee to realize to the full his possibilities.

III. Work Improvement

To learn by observation and to effectuate by organization and administration changes that will facilitate desirable work improvements.

As such, neither organization nor

administration is important. They are valuable only because they contribute to the general efficiency and effectiveness of the plant. With this in mind, the foreman must be always on the lookout for changes that will foster improvement. The defects of organization and administration must be eliminated when they are revealed not to provide for desirable work improvements. As a result of workers' suggestions and complaints, a foreman should learn how to organize the work in his department to remove obstacles and irritations and clear the way for the worker to do his best. It may be a simple matter of supplies or the more difficult matter of cutting through the red tape. For example, an electronic gadget broke down and a few small brass screws were required to repair the job. This happened at 5:30 PM in a plant operating two 8-hr. shifts. There were no such replacement screws in the plant. The foreman of the maintenance crew sensed the situation and sent out and bought a box of screws from a local hardware store. He paid for them out of his own pocket. In turning in his report on the matter, the foreman recommended that in the future there be a small petty-cash account to take care of such emergencies. In the ordinary process of having the matter go through the purchasing department, days or weeks might have been consumed.

In another large plant, where machines were frequently rearranged to produce a new or slightly different product much time was lost in establishing electrical connections because the proper feeder outlets were not universally available. The foreman in this department arranged to have a group of electricians work over a series of successive weekends and set up a wiring system that would enable changes to be made and machines set up simply by plugging into an outlet on the floor. Every machine motor carried its own plug, so changing the location of a machine was as easy as moving a floor lamp from one room to another.

IV. Diagnose Trouble

To assist workers to diagnose trouble, as well as to plan for and apply appropriate remedies.

It is one thing to accumulate quality-control or other data and quite another to interpret data so the necessary modified procedure is indicated. Because of his experience and training, a foreman knows how to interpret data and make plans better than any of the workers. But because he does not do the operations and the men do, he must enlist their cooperation because they are extensions of his abilities. Together the worker and the foreman should study the problem involving a difficulty and agree on a wise course of procedure. One of the most important contributions a foreman makes as supervisor is continuous insistence on the need to understand the cause of the trouble and the importance of devising a method to avoid future trouble.

In an electric motor plant, one worker was having a lot of trouble with the stators he wound. The testing department found he had a large number of stators with some of the winding grounded. He was a fast worker and did more stators than any worker in the department, but he was making extra work for himself and extra work for the inspectors. The foreman found he was forcing two wires through a slot where only one could conveniently go. This broke the cotton covering and scratched the enamel, exposing bare copper wire which would readily short on the laminations of the stator. By showing him how to push the wires into the slot one at a time and by demonstrating to him that the motor would not run with a short-circuit (this involved a visit to another part of the plant), he gained the boy's confidence and admiration. Eventually, that boy became the best stator winder in the department. Originally, the boy understood so little about electric motors that he thought it was simply necessary to get the wires into the slots.

Efficiency improves in a department when the foreman, by promoting individual successes by means of any devices that his ingenuity can suggest or invent, raises the average accomplishment of a worker to superior performance.

TIPS for Top Shop Men

34 Supervision is an art, acquired by painstaking study and practice. Anybody can be a boss, but it takes time, study and understanding to be a BOSS.

35 Every worker has a right to his feelings. No one working for you likes to be bawled out in public. If you criticize, do so in private—save self respect for you and for him.

36 Be time and material conscious. Regardless of product, you deal in only two costly commodities, time and materials. Have proper respect for both, and train your crew to respect them too. *And keep at it!* Throwing away time and material is throwing away money.

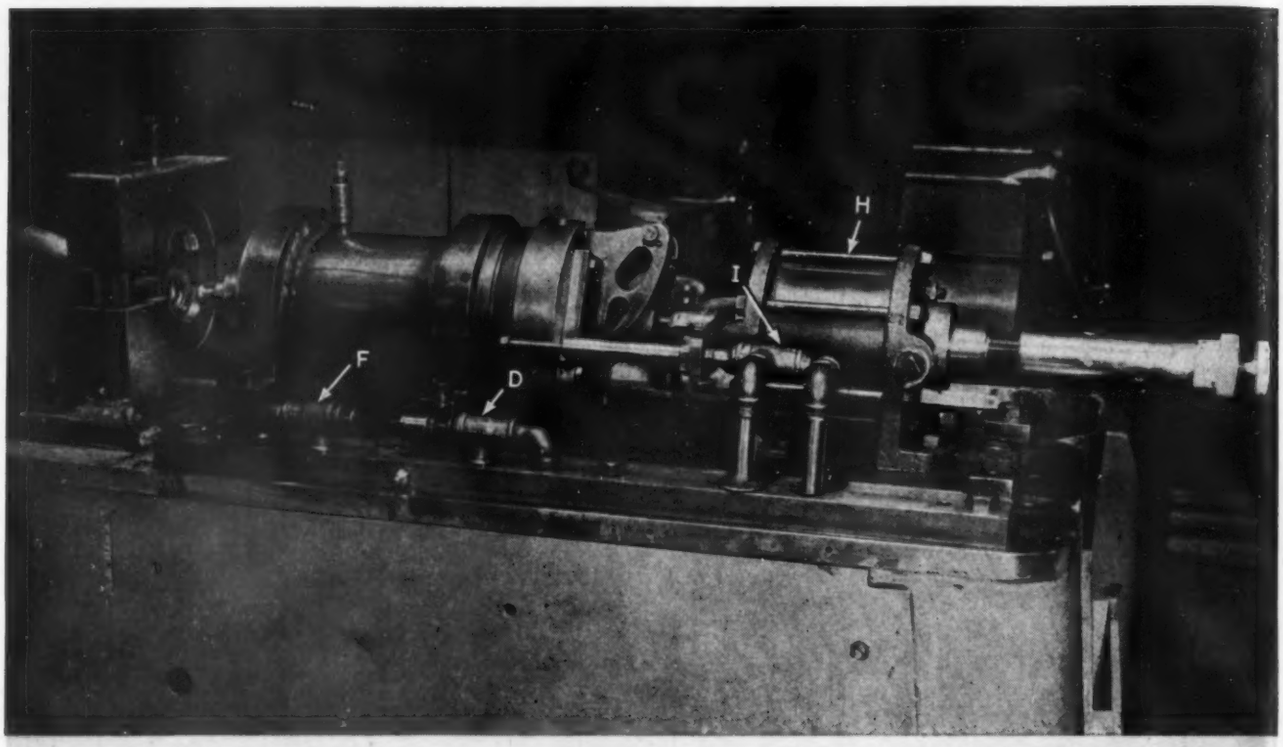
37 There are always two sides to any question, and just because you're on one side, the other is not necessarily wrong. So don't always blame everything that goes wrong on somebody else—back off and take a square look at yourself first.

38 If something has gone wrong, nobody may be at fault. It is perfectly reasonable to assume that instructions were incomplete, or conditions warranted the faulty decision. What would you have done had it happened to you? Oh, yes, you would—like fun!

39 Get your nose onto the grindstone and your hands in the grease occasionally. Don't feel too "important" to dirty your hands with tools to teach somebody how to do a job right. Even Jesus taught by example—which new "general" foremen or new "assistants" frequently forget.

40 A bellow will make some men work, but it only makes others mad. You must allow for differences in temperament in handling workers. Study each person individually and change your approach to suit. You can't be all things to all men—but you've got to be the right things to each man when the time comes.

41 A worker spends a third of his day or more at the plant. It's your job to see that he spends these hours profitably—also your job to see that he spends them as comfortably as possible.



Equipment mounted on the table slide of the tube-beading machine includes valves *D*, *F*, and *I*, air cylinder *H* with its stop assembly and spring-loaded plunger for operating valve *I*, and the spindle assembly with its bellcrank mechanism for shifting the beading-tool spindle off center. The units are shielded to safeguard operators

Tube-Ends of ⅜-to 3-in. Diameter Beaded In Automatic-Cycle Machines

BY E. W. COOPER, TOOL ENGINEER
NORTH AMERICAN AVIATION, INC.

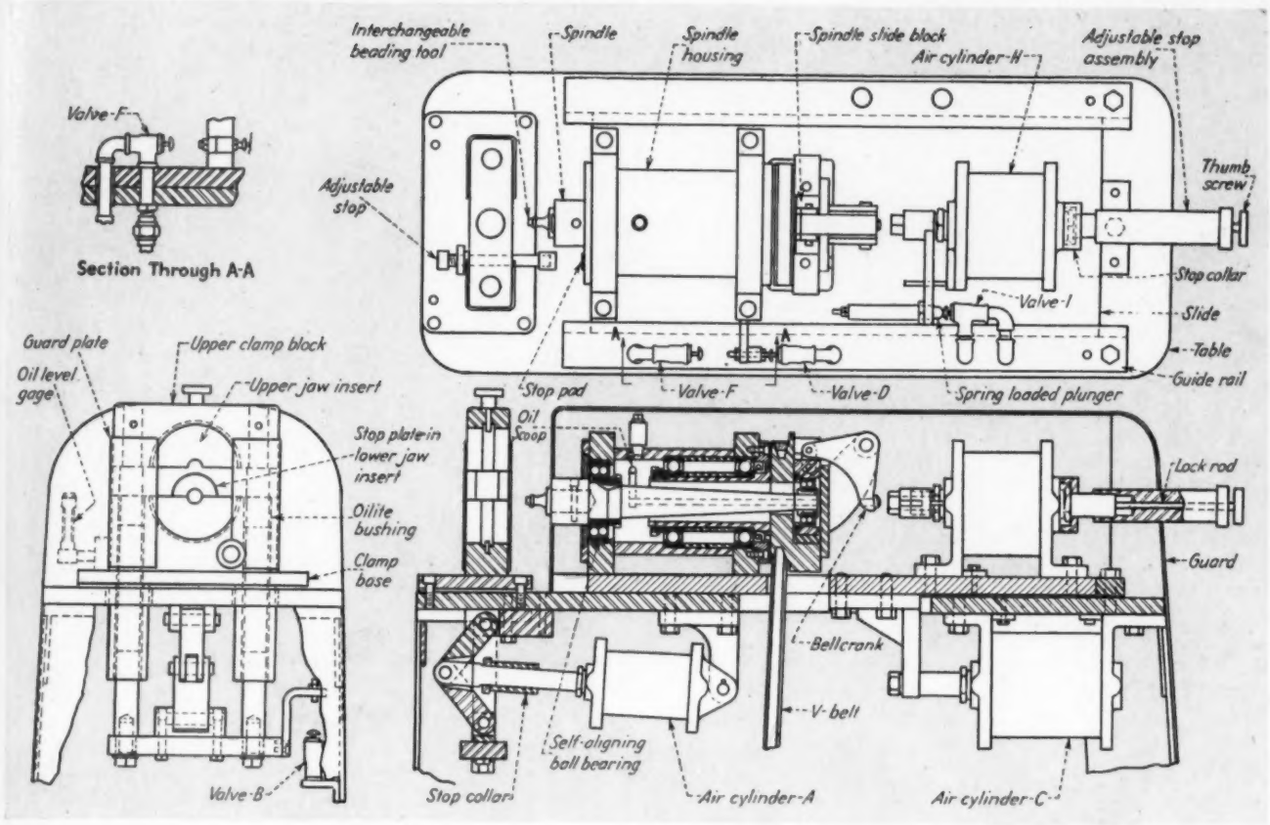
Operator merely presses pedal to start beading operations in machine powered by connected air cylinders and small motor

TUBE ENDS from ⅜- to 3-in. in dia. are beaded rapidly at low cost in a special automatic-cycle machine developed by the tool engineering department at North American Aviation's California plant. Clamp jaw inserts and beading tool are replaced for different tube sizes within the range.

The operator simply inserts a tube into the clamp jaws against a stop ring and steps on the pedal of a three-way air valve. The resulting automatic cycle includes closing the clamp jaws, forward movement of the table slide carrying the beading head, and actuation of the beading spindle. Release of the valve pedal reverses the cycle, returning the machine to starting position.

As illustrated, three air cylinders supply power for all machine movements, except rotation of the spindle. The cylinders are interconnected through normally closed blow valves operating through piston action to control each cylinder.

When the pedal of the three-way valve is depressed, air enters the pilot-operated four-way valve and is forced under pressure to the forward end of cylinder *A*, a double-acting



Principal operating mechanisms of the tube-beading machine are shown. The three-way foot valve, four-way pilot-operated valve and the drive motor with its speed reducer are in the machine base, hence do not show in the sketch as drawn here

Only clamping jaws and a cylinder feed stop assembly are outside the guard shields on this automatic-cycle tube-beading machine developed by North American plant engineers. The spindle centerline is 37 in. above floor level, a convenient height for the average operator

cylinder with 2½-in. bore and 2-in. stroke. Actuation of cylinder *A* operates toggle links in the clamping mechanism to close the jaws around the end of an inserted tube.

As the jaws close, an adjustable stop opens normally closed valve *B*, admitting air to the rear of double-acting cylinder *C*, mounted under the machine table and connected by a bracket to the table slide carrying the beading spindle and its actuating mechanism. Forward motion of the piston in the 4-in. bore, 1½-in. stroke cylinder *C* moves the slide against a stop block and closes valve *D*, in turn opening valve *F* when the table slide reaches the end of its forward stroke and the beading tool is inserted the proper depth in the open end of the tube.

Closing valve *D* and opening valve

F admits air under pressure to the rear of cylinder *H*, which has a 4-in. bore and 1-in. stroke. This double-end, double-acting cylinder is carried on the table slide to operate the bellcrank in the spindle assembly and thus move the beading tool off center. The piston rod at the rear of the cylinder has an adjustable stop assembly to limit forward travel and prevent overloading of the beading tool when it has traveled far enough to form the bead on the end of the tube in process.

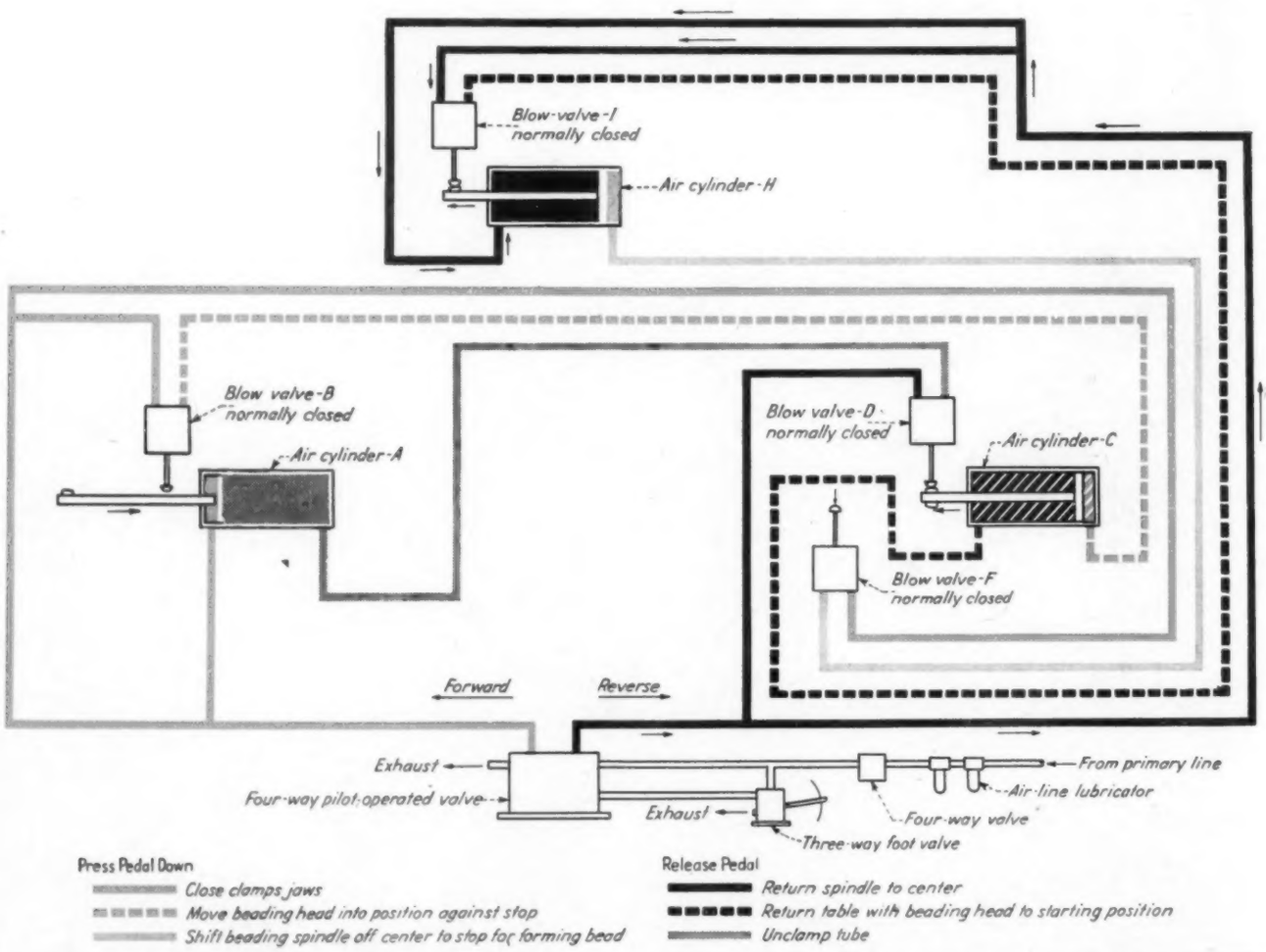
A hardened capscrew on the forward end of the piston rod contacts the bellcrank button. A bracket on the same end bears a spring-loaded plunger which operates valve *I*. Adjustment of the plunger controls the point at which valve *I* is closed as the piston rod progresses. When valve *I* is closed, forward motion of the piston is slowed by cushioning action of air trapped in the forward end of cylinder *H*.

Release of the valve pedal reverses the four-way pilot-operated valve. This returns cylinder *H*, opens valve *I*, and returns cylinders *A* and *C*, returning the beading spindle and table slide, and opening the clamp jaws.

A ½-hp., 900-rpm. motor in the machine base drives the beading spindle through an adjustable speed-reduction unit. A single V-belt connects the pulleys on the unit and spindle assembly. The spindle assembly pulley is on a hollow-spindle quill mounted in two large ball bearings. A slide in the pulley assembly moves radially by action of a bellcrank, actuated by forward motion of cylinder *H* piston. Compression springs hold the slide in neutral.

The beading spindle is supported on two self-aligning, double-row ball bearings. The ball bearing at the rear end is fitted into the radial move- the pulley assembly so radial movement of the slide moves the rear end of the beading spindle off center. This causes an eccentric movement of the beading tool and brings it against the surface of the tube. An oil-scoop tube in the spindle lubricates the radial thrust bearing.

Sheet-metal shields inclose all operating mechanisms except clamp jaws and the adjustable stop assembly at the rear of cylinder *H*. The valve pedal extends through the guard plate at the forward end of the machine and normally is ⅞ in. above floor level. In neutral position, the centerline of the beading spindle is 37 in. above the floor. This is considered a convenient height for an operator standing in front of the machine and holding a tube in position in the clamp jaws.



Operation of the valve pedal permits a complete cycle of the machine. When the valve pedal is depressed, air feeds under pressure in the direction shown by the forward arrow to operate the three cylinders in sequence. Release of the pedal reverses the four-way valve to return the three cylinders to their original position

THE PRESIDENT'S WAGE-PRICE POLICY WON'T WORK

THE AMERICAN public had every right to expect that the long-awaited wage and price policy would break the impasse blocking the way to the swift and orderly reconversion of industry from war to peace.

The policy announced offers little promise of such solution, and this may well constitute a national calamity.

There is only one thoroughly constructive feature of the Presidential Statement of February 14 and its implementing Executive Order. It is the first Government pronouncement since the defeat of Japan to clearly define inflation as the major danger confronting us in the period immediately ahead.

That is a correct appraisal, and one long overdue. Up to now Government spokesmen, almost invariably, have sought to carry water on both shoulders. The Administration has justified its policy of promoting wage increases as a measure necessary to forestall deflation — to keep purchasing power from falling and forcing the economy into a violent tailspin. The strict holding-of-the-line on price ceilings has been defended as necessary to prevent runaway inflation. Unfortunately, while the President now exhorts all to enlist in a crusade against inflation with a voice that is clearly Jacob's, his program for dealing with it still employs the hairy hands of Esau to promote the very danger which he is urging everyone else to combat.

The "new" policy provides for a continuation of the wage increases that have been pressured through by Government mediators, "fact-finding" boards, and direct seizures until they have been made general throughout industry upon the dimension established in recent patterns. It offers industry the single concession of prompt hearings and decisions upon claims for price advances, but the yardsticks for judging such claims are exactly those which OPA has applied in the past. Since the past procedure has led us into our present difficulties, it is hard to see how it will serve now to lead us out of them.

Past Government Policy Fostered Dissension

At the war's end, it was obvious to everyone that what was needed was the swiftest possible reconversion of industry. It should have been equally apparent that we were faced with the difficult problem of controlling tremendous inflationary pressures which would be particularly insistent until peacetime production could be mobilized at high volume. This was made almost inevitable by the huge backlog of accumulated demand, for both capital and consumer goods, and by the unprecedented volume of liquid funds at the disposal of individuals of all classes. The only circumstance that could have modified the inflationary complexion of the postwar picture was the possibility of such wholesale and prolonged dislocation and unemployment in the process of readjustment that people would have been frightened into freezing onto their savings instead of spending them.

It soon was apparent that just the opposite was taking place. The early transition was extraordinarily swift, unemployment was lower than anyone had dared hope, and civilian spending outstripped all previous records. The circumstances called for strong anti-inflationary fiscal measures, along with a firm maintenance of price and wage controls alike.

Instead of adopting such a balanced program, the Government immediately discarded all wage controls, and in addition started an active campaign for promoting large wage increases. The President, upon a number of occasions stated flatly that American industry generally could and should grant substantial pay advances without any compensating price rises. His Office of War Mobilization and Reconversion estimated that average increases were practicable to the extent of 24 per cent. Given such Governmental encouragement, it was inevitable that labor leaders should do exactly what they did—file extravagant wage demands at the beginning of the reconversion process, when accurate appraisal of production schedules and costs were least susceptible of calculation, and when the shortage of civilian goods multiplied the inflationary effect of any increase in purchasing power.

At the same time, the OPA was fighting to hold the price line in a good cause, but with singularly inept procedure. It acted, seemingly, upon the premise that it was always better to give less price relief than was needed rather than enough, that relief provided under its formula was preferably to be granted later rather than on time, and that the interests of lower-bracket income receivers should be protected by a particularly tough resistance to raising prices of cheaper goods. The latter procedure seems to have boomeranged by virtually driving many of the lower-priced lines off the market.

The sum of these wage-price procedures resulted in work-stoppages of epidemic scope. Many business concerns faced with the prospect of immediately unprofitable operation, uncertain that new wage demands would not be made with Government support as soon as volume production was established, and without assurance as to when price controls would end, refused to assume inevitable losses even when confronted with combined union and Government pressure. The fight was on.

"New" Policy Differs Little From Old

With inflation now clearly recognized as the immediate danger, it might have been expected that the new wage policy would reverse the former practise of lending active encouragement to new wage advances. But that would have brought down upon the Administration the wrath of all organized workers who had not yet been granted increases already bargained through by other groups. This was avoided by directing the National Wage Stabilization Board in effect to approve any wage increases necessary to give general advances comparable to those already made. The only brake applied on the wage side lies in a directive to the Board not to approve, as a basis

for price relief, wage advances that go beyond the established pattern.

On the price side, the new directives to the OPA entail no important departure from its past procedures. Even the concession to review "hardship" cases promptly rather than after six months is only a pious hope, since it is unlikely that OPA is equipped to deal rapidly with the thousands of cases that will arise. A hardship case is defined as one in which, after absorbing an approved wage advance, an industry or establishment in a twelve months' period of normal-rate operation is judged by the Price Administrator likely to operate at a rate of profits to net worth less than it averaged in the base period of 1936-1939.

Let us see what this really means. In the first place, the rate of manufacturing profits in the base period was only moderate. But since the average net worth of manufacturing corporations has increased one-third over what it was in the base period, the application of the OPA formula, *assuming that its Administrator correctly appraises the twelve-month outlook,* seems to provide for absolute profits one-third higher than the 1936-1939 average.

The OPA formula, however, applies to profits *before taxes.* What really matters to stockholders is profits *after taxes.* Corporation taxes have been increased from an average of 17 per cent in the base period to 38 per cent now. This means that the price adjustments granted by OPA on average will yield profits *after taxes* no larger in dollar terms than in the 1936-1939 period, although 1946 manufacturing sales are expected to be more than twice as high. Under this procedure the *ratio* to net worth of profits *after taxes* will be one-fourth lower than the 1936-39 average. This clearly undermines the incentives upon which production at high level depends.

The workers get wage increases which promote inflation. The Government, bailed out from its previous mistakes, gets political credit for raising wages. And the entire bill is handed to American industry for payment.

But the Danger of Inflation is Real

Under these circumstances, there is a growing demand on the part of business groups that price controls be rescinded immediately. It is argued that, once the restrictive influence of price controls is relaxed, capacity production soon will supply sufficient goods to prevent undue price inflation.

It is understandable that business should wish to be rid of Government controls which have operated in such a thoroughly inconsistent and damaging fashion. Unfortunately, there is ground for believing that more harm might result from this cure than from the disease.

There is nothing in our situation that could bring on the kind of inflation that has been experienced by certain countries of Europe and Asia—in which the value of currency deteriorates until it takes a cartload to buy a pair of shoes. But our situation now is definitely more threatening than it was in 1919, after the first World War. At that time wholesale prices and the cost-of-living skyrocketed almost 25 per cent within twelve months. If we discard all controls now, as we did then, prices might easily go up from 25 to 50 per cent in a year's time.

An inflation of that dimension can do tremendous damage. While it lasts, all those dependent upon fixed incomes are damaged—all bondholders, including those who hold war bonds, all life insurance and annuity beneficiaries, all pensioners. Generally, the purchasing power of wages and salaries would shrink, with white collar and unorganized production workers hardest hit. Controlled-rate industries, such as railways and other utilities, would be squeezed. General business would suffer least of all—while the boom lasted.

But such soaring booms cannot last. The 1919 boom burst in mid-1920. By summer of 1921 industrial prices had fallen 40 per cent and industrial production was off 35 per cent; farm prices had fallen 50 per cent. This time the boom might soar higher and last longer, but that would merely result in an even more precipitous drop. Business would be hard hit along with everyone else, and high wage rates would mean nothing to the unemployed.

Controls Must be Consistent and Progressively Relaxed

But if the Nation cannot afford to risk disastrous inflation by immediately abolishing controls, neither can business afford to accept the program which the Administration now proposes.

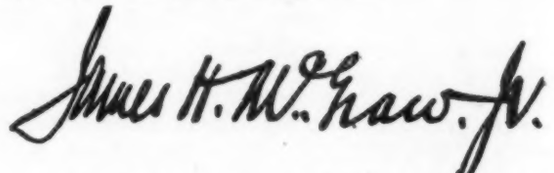
The wage-price policy will not hold the inflation line so long as the Administration is leading the assault to breach that line on the wage side, as it has done ever since VJ-Day.

The Administration is now going before Congress to ask for a broad extension of its wartime powers for an additional year beyond June, 1946.

Congress must see that this is not granted except upon terms that guarantee the use of such power with a consistency that has been conspicuously absent up to now.

1. It must provide sufficient price relief to yield profits normal to high-level operation.
2. The basis for price relief must be clearly defined and geared to actual costs of operation at the earliest possible date.
3. OPA administrative procedures must be speeded-up and streamlined, or the delays that characterized past administration will become intolerable.
4. It must see that, once established, the new line is held as long as wartime controls are continued by enforcing restrictions on wages as well as prices.
5. It must set an early date for the termination of all wartime controls and provide for progressive and bold steps for de-control to be taken before that date, as soon as production levels in any field are sufficiently high to restrain runaway prices.
6. It must proceed without delay to marshal fiscal and monetary policies to combat inflation, in order that price controls may be discarded at the earliest possible date.

Unless Congress does this—and it will not be easy in an election year—we are headed for an explosion. It will come in one of two forms—either in a continuance of industrial strife, or in a rocketing inflationary boom that can only end in collapse and depression.



President, McGraw-Hill Publishing Co., Inc.

ROUND TABLE

Windowless Shops?

"Do you know what those fatheads in the front office are talking about now, Al? They came around this morning and were looking over the toolroom—had some consulting guy along, checking up on how much it would cost to fill in the walls and put in special air conditioning! I didn't get all he said, but the dope thinks we can save money by doing it."

"A windowless shop, eh, Ed? You'll be right in the latest swim—have an air-conditioned office just like the brass hats. Of course, you'll lose your view of the railroad tracks and the paint shop. That should break your heart. What'll you do without the smoke and dust? You boys will have to wear white shoes!"

"I might have expected some wise crack like that from you. It's bad enough to have to work at all—like being in jail most of the day—without being shut off from light and air. A guy likes to rest his eyes once in a while."

"Is that why you have your office on the inside wall, Ed? I never knew you were a nature lover. Just a couple of months ago you were hollering about the way the wind blew in around the door and windows. You said everybody was getting colds from working in a barn—that how could they expect you to turn out close work when temperature went all over the lot, with the sun and wind."

"That was just the usual grousing over the weather, Al, and you know it. Got to have something to fuss about. But this business of walking into a tomb every day—that gets me. We'd never know whether it was raining or sunshiny outside."

"Seriously, Ed, from what I hear, the whole idea of being shut in is just talk. The same guys that holler about being in a cell in a plant go to a movie and sit on a hard seat for three hours, or into a basement bowling alley and think nothing about it. Besides, what difference does it make about the weather? You can always dress for it when you start home."

"That may be all true, Al, but from what I hear, guys get colds and everything else from working in an air-conditioned place. And, what's more, it would be plain Hell to go into normal summer weather after spending a whole day with no sun and no sweat."

"What's the matter, Ed, afraid you'll get to liking going to work? You might not have nearly as many headaches, either. No dust, no hot or cold days to throw measurements cockeyed, no swelled-shut bin doors and rusted tools in summer or cracked toolboxes in winter. Tough to take, that is!"

"It ain't all as sweet as you make it out. We'd have to stay inside for lunch, even on nice days—for fear we wouldn't be able to take the change."

"Most of your guys stay in the cafeteria anyway, Ed. Fixing that up paid out for the company—and all the boys who used to kid about it use it now. Maybe this saves too. No windows to wash or replace when they're busted, no fights over ventilation or light, no space wasted around buildings for air spaces, no awnings or blue-painted windows. Boy, is that hard to take!"

ARE WINDOWLESS SHOPS A FAD *or the coming thing? Is the psychological effect on workers a problem? Do air conditioning and controlled lighting pay out in saved work and reduced sickness? Your experience or opinion will be interesting and helpful to other readers. Published discussions will be paid for*

Cutter Adjusts for Slot Width

TWO BLADES REPLACE FOUR IN REDESIGN OF MILLING CUTTER FOR RODS

BY WILBERT RADTKE
THE CORNELIUS COMPANY

SMALL BRONZE master connecting rods for the lightweight, 3-cyl. air compressor developed by Cornelius for the *Superfortress* and other planes must be machined to precision limits. Slotting of the two sides of the hub for the articulated connecting rods is performed on a simple two-position fixture on a No. 1 Sundstrand *Rigidmil*.

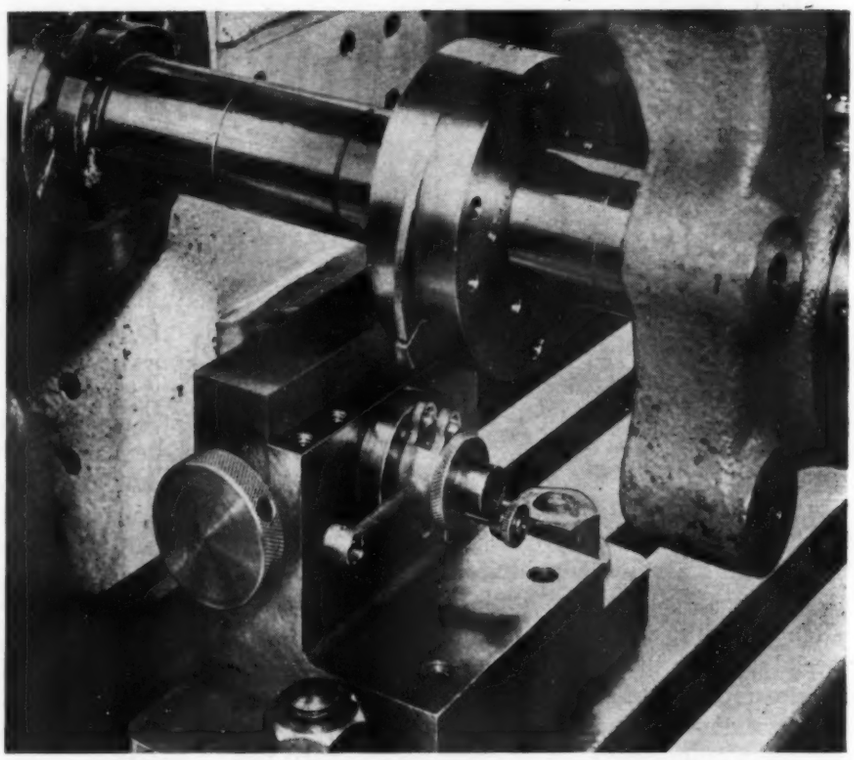
Originally, slots were milled with solid slotting cutters having four carbide-tipped teeth. Resharpening of tooth sides resulted in a decrease of slot width. In addition, if one tip broke or cracked, all four had to be replaced. After using such cutters for some time, Cornelius engineers developed this two-bit slotting cutter.

Built in two heavy sections to assure smooth operation with minimum chatter, the 4-in. dia. body mounts two standard 5/16-in. square carbide-tipped bits. Each bit is separately locked in its body section with four ¼-in. hollow-head setscrews. Cutting-face width is slightly narrower than the slot width. Each bit is set to cut either the right-hand or left-hand side, insuring freer cutting action and a more accurate slot.

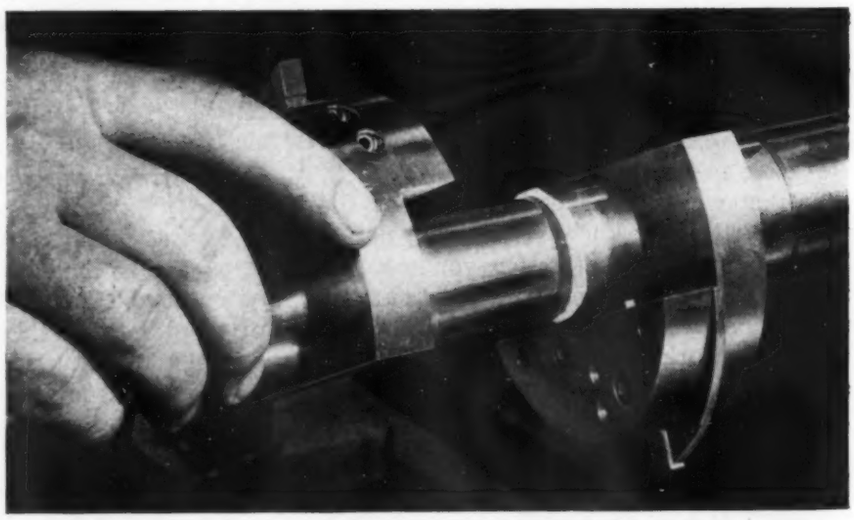
Width of the slot cut is set by spacing the halves of the cutter body on the arbor with thin Artus plastic spacers. These spacers are colored for easy identification and range from 0.001 to 0.030 in. thickness.

As shown, a support arm projects from each body section immediately behind the toolbit slot, to support the end of the bit. Each projection is ⅛ in. wide and has a maximum height of ⅜ in. at the slot end.

Width of the assembled body is 1 5/16 in. and it is machined to fit accurately on a 1¼-in. standard arbor. As bit support projections are accurately in line when the halves are assembled without spacers, the minimum width of slot which can be machined is slightly greater than ⅛ in. Approximately ½ in. of spacers can be used between the cutter body halves, thus making it possible to mill a slot having a maximum width of approximately ⅞ in. if the 5/16-in. bits have ⅜-in. wide carbide tips.



Hubs of master connecting rods are slotted for the articulated rods in this setup on a No. 1 Rigidmil. The two-tooth cutter body shown is made in two parts so blades can be spaced accurately for precise milling of required slot width



Each cutter-body half is machined to carry a standard 5/16-in. square toolbit tipped with cemented carbide. An eccentric projection behind each bit slot assures adequate support of the bit. By using Artus plastic spacers cut down to fit between the projections on the body halves, these half sections can be spaced apart so slot width can be held within precise limits

TALKING SHOP

Blow the Hut Down

SEEING THE Quonset building erected by Great Lakes Steel at the Metal Show reminded us of the Navy method of dismantling 'em. We should explain that these huts are tight jobs. Corrugated sheathing steel is nailed into a nested groove between paired formed-steel sections that make up each portion of the framework. Taking sections off represents a sizable task. So the Navy puts boards across the inside of door and window openings, then sets off dynamite inside. Most of the dismantling time is chargeable to picking up and piling sheets. This might be a suggestion for disposing of unneeded war plants — and would certainly deliver building materials to the neighbors.

Cheesecake

OUR PET PICTURE of that Quonset hut shows a curvaceous sweater blonde supposedly driving a nail into that patented groove. There's no sheathing over the frame section, so no work for the nail, and if she hit it with the hammer at the pictured angle, she'd bend the nail. We hasten to reassure you that we like blondes —particularly in cheesecake poses— as well as the next guy, maybe better. But we like the time, the place and the gal to be copacetic. Why must every very big or very little gadget be shown for size in competition with a Powers model — and every tired publicity man figure that a dame will rescue an otherwise hopeless idea? Early in the war, when wing dope was scarcest, one West Coast outfit broadcast a shot of one sweater girl supposedly spraying dope stockings on another gam girl. Both were aircraft workers, of course—it said in the release. The life of an editor is not bread with jam, but cheesecake with gams. To prove it, we have a statistic: There are 2½ mi. of nylon yarn in a pair of stockings. If she's long-legged, add a half-mile.

Use for Talcum

WE HEAR THAT the preferred Detroit way to test for leaks in auto bodies is to sprinkle talcum powder inside doors and body joints, then drive past huge wind machines at high and low speeds. If the talcum is dispersed, a leak is revealed. Reminds us of the method for testing for leaks in a high-temperature steam line. Steam under these conditions is invisible until it cools enough to condense some distance away. You put a rag on a stick and move it along the line. When the rag bursts into flame—there's your leak. That's a hard idea to grasp if your experience with steam stems from bouts with a teakettle.

Have Tolerance

A RECENT Parker "51" ad has this headline: "Why the Parker '51' pen can never be 'mass-produced.'" The reason the ad-writer gave is: "precision craftsmanship . . . no tolerance to exceed plus or minus 0.001 in." There's even a cross-section drawing showing typical tolerances. If we ever need to prove that metalworking is **not** a mass-production industry, we know which ad-writer to ask. We'd tell him about tenths and hundredths of thousandths and how parts to those tolerances are mass-produced, but it would break his heart.

Hot Hip

LOOKING AT the non-linting launderable wiping cloths being shown at the Metal Show booth across the way, one of our visitors was reminded of the blue waste used at Warner & Swasey during his apprentice days. Stunt-of-the-day was to wait until the newest apprentice got an oily handful in his hip pocket, then drop in a match. Alongside that, the modern hot foot is a lower form of horseplay. But then, we apprentices used to wait until old Sweeper George left his wheelbarrow full of wastecan paper and trash unguarded. A bolt or stick through the wheel and a match into the load guaranteed a few exciting minutes. Maybe safety directors have a real purpose in life.

Safety Last

A COMPANY had just been awarded a safety plaque for its record. As the safety director began to hang it, it slipped from his fingers and fell onto his foot, breaking his ankle.

For Pigeon Unfanciers

DOCTOR WATERHOUSE, at the Industrial Gas breakfast during the Metal Show, said he'd been surprised to see the control boards for the big blooming mill at Armco carefully roofed over—and inside the building. It seems that Middletown is plagued with starlings —which every night fly from the surrounding country into the warmth of the blooming mill and roost on the rafters. Mill operators had to add a second roof to control an ancient, but potent, form of atomic bombing.

Square Drive

OUR YARNS about boring a long taper in recent issues, and final suggestion that the taper be obtained by forcing a tapered pin into a straight-bored hole, should probably be implemented by a story of the days before splined shafts. One early auto had a square drive shaft fitting a square hole in the wheel hub. To save an onerous machining job, they made the hub of malleable iron, drilled a round hole in it, and squared it up by driving through a square tapered pin.

Basic Relationship of HYPOID GEARS ... III

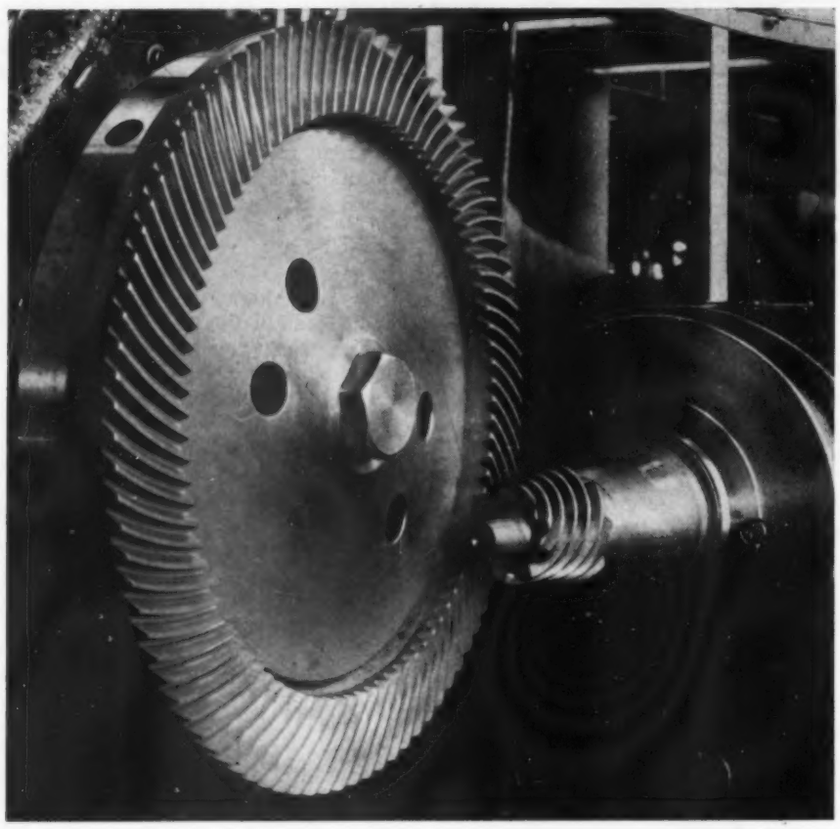


Fig. 18—This 10/1 reduction hypoid-gear pair for a machine tool requires a barely discernible pressure-angle unbalance

Hypoid gears can be generated with a rotating face-mill type cutter describing a tooth of basic members which are helical segments instead of crown gears

BY ERNEST WILDHABER, GLEASON WORKS

THE BUTTRESSED TEETH on most hypoid gears are not accidental. They are made so deliberately to balance tooth action on both sides. The required amount of unbalance of pressure angles has been derived. In general, however, maximum unbalance is required on low ratios and large offsets.

A high-reduction hypoid pair, cut with face-mill cutters and ground, Fig. 18, has a negligible pressure-angle unbalance. When the ratio becomes nearly 1/1, as in Fig. 19, this unbalance is substantial. Such pairs of large size are cut on Gleason generators with reciprocating tools. Teeth produced are of slight curvature when considered as wrapped into a plane.

Formula (16), derived in the previous installment, is general and applies to curved, nearly straight and straight teeth alike. For straight teeth the value within brackets in this formula becomes zero. Other special cases permit further simplification of formulas (15) and (16).

In one special case, the limit pressure angle ϕ_o is zero. In this case no pressure-angle unbalance is required.

Fig. 20 illustrates the characteristics, with reference to the pitch plane. The axes of the gear pair intersect the pitch plane at points O' and O'', whose connecting line $O'O''$ is parallel to the pitch line tangent t. $A \sin \psi$ and $A_p \sin \psi_p$ are then equal; $A = PO''$ and $A_p = PO'$. This results in tan ϕ_o and ϕ_o being zero, formula (15). Moreover, the curvature center C_o is here located at the projection of points O' and O'' to the pitch line normal, as can be verified by transformation of formula (16).

As apparent from the reduced cone distance A_p of the pinion, the pinion is substantially tapered in this design and the teeth have a small curvature radius, as compared with the cone distances. These characteristics are valuable on drives with comparatively small shaft angles.

Fig. 21 illustrates a case at the other end of the field. Here the taper of the pinion is zero and its pitch surface is cylindrical. The position of the curvature center on the pitch line normal depends on the taper of the gear member, and is shown at C_o for a crown gear. It would be at C_o' for a tapered gear.

It is apparent then that the taper and the lengthwise tooth curvature are so related that an increased taper of the pinion calls for a smaller radius of lengthwise tooth curvature.

Producing Hypoid Drives

In principle, hypoid drives can be made by as many different processes as bevel gears. Most important, they can be produced by generation.

In one case the tooth shape of one member is assumed, and the other member is generated with a tool representing this member, with motions as if the member being cut were in mesh with the gear represented by the tool. Formate hypoid pinions are produced this way. Formate drives are used for high production, when the gear pitch angle is not less than about 70°.

Formate hypoid gears contain tooth spaces which are the exact counterparts of the surfaces described by the rotating cutter. The hypoid pinion conjugate thereto is produced by describing one side, or both sides, of a gear tooth with a rotating cutter, in a motion as if the gear were in mesh with the pinion to be produced.

A more general form of generation is from a basic member, as on bevel gears. On bevel gears, the crown gear represents a preferred form of basic member. The tooth sides of the

basic member can be imagined to be infinitely thin, so that they can be interposed between the intermeshing teeth of the considered gear pair. A basic member is characterized by its capacity to contact both gears at any turning position along the same lines, along which the gears contact one another.

Fully conjugate gears contact each other along lines which sweep the tooth sides from end to end, as the gears turn.

Any two gears are conjugate to each other, when they are conjugate to the basic member on opposite sides of its imagined infinitely thin tooth surfaces, or when they are conjugate to a pair of complementary basic members. This is so, regardless of how well the design fulfills the requirements of pressure-angle unbalance and of lengthwise tooth curvature. The latter requirements are directions for good designs, how to keep away from undercut and from other ills, but do not affect conjugacy of the working surface, or of the part of it on which contact is kinematically possible.

The Basic Member

To contact along the same lines with the two gears of a hypoid pair, at all turning positions, the basic member must have the same instantaneous axis as the gear pair when it meshes with the gears. Moreover, relative motion of this mesh should be of the same nature as between the gears themselves, namely a motion about and along the instantaneous axis. Most important is the requirement that the proportion of the turning motion about the instantaneous axis and of the motion along it is the same as in the mesh between the gear pair. That is, the lead L_i about the instantaneous axis, should be the same as in the mesh between the gear pair, and equal to the amount given in formula (6).

It is this requirement of instantaneous lead which was overlooked in prior art, so the existence of a basic member was in doubt and subject to guesswork.

Figs. 22 to 25 are similar to Figs. 2 to 5, but new lines are added. Fig. 24 shows the geometrical addition of angular velocities. Angular velocity ω' about the pinion axis C' is plotted as a distance OK in a direction parallel to the pinion axis, and angular velocity ω'' about the gear axis is plotted as a distance KL. OL is the resultant angular velocity about the instantaneous axis. In Fig. 23, lines OG' and OG'' are perpendicular to axes C' and C'' and represent the peripheral velocities of the pinion and gear at point O.

In addition to the gear whose axis is at C'', there are other gears which can mesh with the pinion to roll and slide on its given pitch surface. Thus a gear may be considered, whose axis is parallel to line KX, Fig. 24, which includes an angle Γ_x with the direction OL of the instantaneous axis.

The first considered gear pair has a relative motion, which at any instant is a helical motion about the instantaneous axis, with a given lead L_i expressed in formula (6). The proportion of $G'G''$ shown in Fig. 23 and OL shown in Fig. 24 is a measure of this lead. To give the same instantaneous lead L_i, OY, the straight line connecting points O and Y, Fig. 23, should be the peripheral motion of the new gear at point O, where the proportion $\frac{G'Y}{OX}$ is equal to $\frac{G'G''}{OL}$. It is evident, however, that any considered new gear is unable to fulfill this requirement.

This means then that no different gear can mesh with the pinion with the same kind of relative motion, namely with the same lead L_i about the instantaneous axis. A given pinion would mesh along different surfaces of action with different gears, even though their pitch surfaces all contact along the instantaneous axis. As a result no crown gear or other circular gear can be a basic member of a generated hypoid pair. However, helical segments can be determined to fulfill the above proportion, and to mesh with the pinion and the gear, with the same instantaneous lead as the gears mesh with each other, and with the same instantaneous axis.

A helical segment does not merely turn on its axis, but it also moves along its axis in proportion to its turning motion. The motion per full turn is its lead L. A helical segment, whose axis C_s is parallel to any line KX, Fig. 24, should have an angular velocity as measured by distance KX, when the angular velocity of the pinion is measured by distance OK. This results in an angular velocity about the instantaneous axis, as given by distance OX.

The angular velocities and turning motions are also determined by geometrical addition, as on bevel gears and hypoid gears. Neither the translation along the axis of the helical segment, nor its shaft offset has anything to do with it.

These are, however, the determining factors for securing a velocity OY, Fig. 23, at point O, which fulfills the above said proportion, which can also be put down as

$$\frac{G'Y}{G'G''} = \frac{OX}{OL}$$

In other words, point Y should intersect line $G'G''$ in the same proportion as point X intersects line OL.

$$OX = OK \sin \gamma_k \, (\operatorname{ctn} \gamma_k + \operatorname{ctn} \Gamma_s)$$

$$OL = OK \sin \gamma_k \, (\operatorname{ctn} \gamma_k + \operatorname{ctn} \Gamma_k$$

$$\frac{OX}{OL} = \frac{\operatorname{ctn} \gamma_k + \operatorname{ctn} \Gamma_s}{\operatorname{ctn} \gamma_k + \operatorname{ctn} \Gamma_k} = \frac{\tan \Gamma_k + \tan \Gamma_k \tan \gamma_k \operatorname{ctn} \Gamma_s}{\tan \Gamma_k + \tan \gamma_k}$$

$$OG = OG' \cos \gamma_k = E_p \omega' \cos \gamma_k = \frac{E \, (\omega' \sin \gamma_k)}{\tan \Gamma_k + \tan \gamma_k}$$

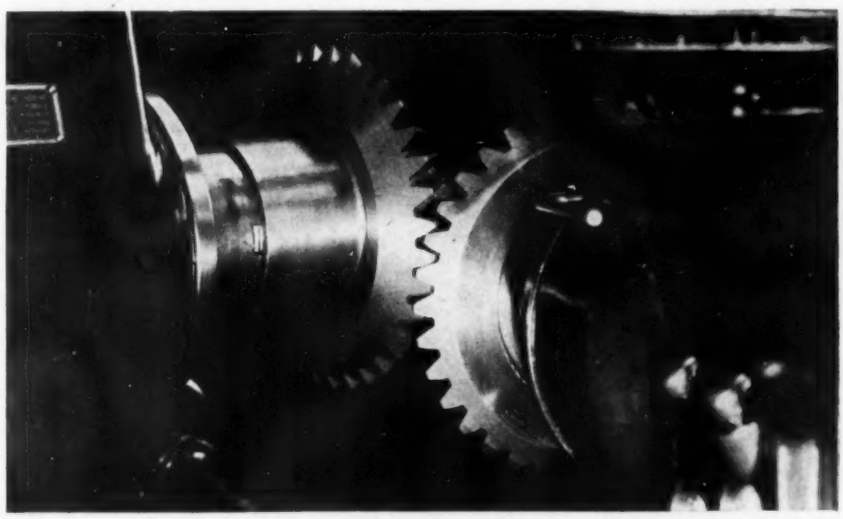


Fig. 19—Near-miter gears with substantial shaft offset require an ample pressure angle unbalance so the teeth appear buttressed

$$G'G'' = OG\ (\tan \Gamma_k + \tan \gamma_k) = E\ (\omega' \sin \gamma_k)$$

$$GG' = OG \tan \gamma_k = \frac{E\ (\omega' \sin \gamma_k) \tan \gamma_k}{\tan \Gamma_k + \tan \gamma_k}$$

$$GY = G'G'' \cdot \frac{OX}{OL} - GG'$$

$$= E\ (\omega' \sin \gamma_k) \cdot \frac{\tan \Gamma_k + \tan \Gamma_k \tan \gamma_k \operatorname{ctn} \Gamma_x - \tan \gamma_k}{\tan \Gamma_k + \tan \gamma_k}$$

The peripheral velocity OZ at point O of the helical segment, and its lead velocity YZ are obtained by resolving the resultant velocity OY into components perpendicular to axis C_x of the helical segment, and parallel thereto. Hence

$$OZ = E_x \omega_x = OG \cos \Gamma_x + GY \sin \Gamma_x$$

$$E_x \omega_x = \frac{E\ (\omega' \sin \gamma_k)}{\tan \Gamma_k + \tan \gamma_k} \cdot \left[\cos \Gamma_x + \sin \Gamma_x \left(\tan \Gamma_k - \tan \gamma_k + \frac{\tan \Gamma_k \tan \gamma_k}{\tan \Gamma_x}\right)\right]$$

$$E_x (\omega_x \sin \Gamma_x) = \frac{E\ (\omega' \sin \gamma_k) \sin \Gamma_x \cos \Gamma_x}{\tan \Gamma_k + \tan \gamma_k} \cdot \left[1 + \tan \Gamma_k \tan \gamma_k + \tan \Gamma_x (\tan \Gamma_k - \tan \gamma_k)\right]$$

The above bracket value amounts to

$$\frac{\cos (\Gamma_k - \gamma_k) + \tan \Gamma_x \sin (\Gamma_k - \gamma_k)}{\cos \Gamma_k \cos \gamma_k} = \frac{\cos [\Gamma_x - (\Gamma_k - \gamma_k)]}{\cos \Gamma_k \cos \gamma_k \cos \Gamma_x}$$

Furthermore $(\omega_x \sin \Gamma_x) = (\omega' \sin \gamma_k)$; hence

$$(17)\ E_x = E \frac{\sin \Gamma_x \cos [\Gamma_x - (\Gamma_k - \gamma_k)]}{\sin \Sigma}$$

$$\Sigma = \Gamma_k + \gamma_k$$

$$(17a)\ \Gamma_x = 90°;\ E_x = E \frac{\sin (\Gamma_k - \gamma_k)}{\sin \Sigma}$$

$$(17b)\ \Gamma_x = 90°, \Sigma = 90°;\ E_x = E \sin (\Gamma_k - \gamma_k) = E \cos 2\gamma_k;$$

It is seen that the axis of the helical segment is ordinarily offset from the instantaneous axis, at the above amount E_x. In the special case described by formula (17b), the offset E_x can also be put down as

$$E_x = E\ (\cos^2 \gamma_k - \sin^2 \gamma_k) = E_g - E_p$$

The axis of the helical segment is then offset from the gear axis a distance E_g minus the above amount, that is a distance E_p, equal to the offset between the instantaneous axis and the pinion axis.

$$YZ = \frac{L}{2\pi} \omega_x = OG \sin \Gamma_x - GY \cos \Gamma_x$$

$$\frac{L}{2\pi} (\omega_x \sin \Gamma_x) = \frac{E(\omega' \sin \gamma_k) \sin \Gamma_x \cos \Gamma_x}{\tan \Gamma_k + \tan \gamma_k} \cdot \left[\tan \Gamma_x - \left(\tan \Gamma_k - \tan \gamma_k \times \frac{\tan \Gamma_k \tan \gamma_k}{\tan \Gamma_x}\right)\right]$$

The above bracket value amounts to

$$\tan \Gamma_x + \tan \gamma_k - \frac{\tan \Gamma_k}{\tan \Gamma_x} (\tan \Gamma_x + \tan \gamma_k) = \left(\tan \Gamma_x + \tan \gamma_k\right) \left(1 - \frac{\tan \Gamma_k}{\tan \Gamma_x}\right)$$

$$= \frac{\sin (\Gamma_x + \gamma_k)}{\cos \Gamma_x \cos \gamma_k} \cdot \frac{\sin (\Gamma_x - \Gamma_k)}{\sin \Gamma_x \cos \Gamma_k};$$ hence

$$\frac{L}{2\pi} = \frac{E \sin \Gamma_x \cos \Gamma_x}{\sin \Sigma} \cdot \frac{\sin (\Gamma_x + \gamma_k) \sin (\Gamma_x - \Gamma_k)}{\sin \Gamma_x \cos \Gamma_x}$$

$$(18)\ \frac{L}{2\pi} = \frac{E}{\sin \Sigma} \sin (\Gamma_x + \gamma_k) \sin (\Gamma_x - \Gamma_k)$$

$$(18a)\ \Gamma_x = 90°;\ \frac{L}{2\pi} = \frac{E}{\sin \Sigma} \cos \gamma_k \cos \Gamma_k$$

$$(18b)\ \Gamma_x = 90°, \Sigma = 90°;\ \frac{L}{2\pi} = E \sin \Gamma_k \cos \Gamma_k = E \sin \gamma_k \cos \gamma_k$$

The above formulas completely define the helical segments, which can be used as basic members for generating both gears of a hypoid pair. Their axes all intersect line e, Fig. 22, and are in planes parallel to both axes C' and C''. With right shaft angles of the hypoid pair, $\Sigma = 90°$, they all intersect line e at points between O' and O'' at which axes C' and C'' interesect line e. This follows from an interpretation of formula (17).

Such basic members can be broadly used with any form of tooth, also with pitch surfaces of the gears which differ vastly from the kinematic pitch surfaces used here for analysis. Thus the basic helical member may have teeth curved lengthwise which may extend outside of the kinematic pitch surfaces, and which can be readily described by a cutter or grinding wheel.

In generating a hypoid gear or pinion, the cutter represents a tooth of the basic member. During cutting, feed motions are provided about the axis of the gear blank, and about and along the axis of the helical basic member, which on Gleason generators is the axis of the cradle. The axial feed motion during cutting presents no difficulties on the present generators, and involves merely a change of the feed cam.

The reason that this mathematically correct and broad generating method is not in wide use today is that there exist further methods of generating hypoid gears with face-mill cutters, also devised by the author, at the Gleason Works. These methods do not require feed motion along the cradle axis during cutting, and can also be practiced on old generators lacking provision for such feed.

They are exact as far as curvature. That is, the tangent planes to the tooth sides, at a mean point, are matched on the mating gears produced thereby, and the curvature in

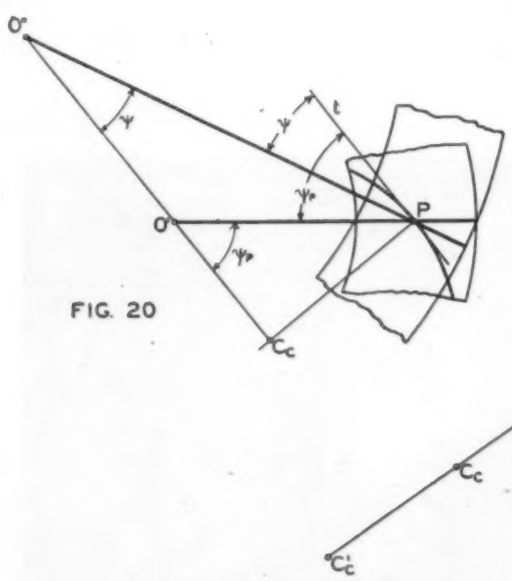


FIG. 20

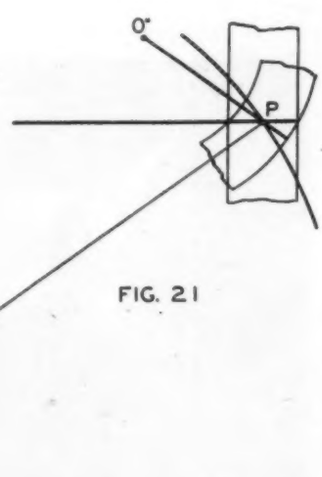


FIG. 21

Fig. 20—Pitch plane of a hypoid-gear pair of unusual design, requiring no pressure-angle unbalance and resulting in pinions of unusually large taper and small cone distance $O'P$, with sharply curved teeth. Cone distance of the pinion is infinitely large and its pitch cone has become a cylinder in the pitch plane of this hypoid pair

all sections through the mean point is exactly as it should be. Even though the methods based on obtaining matching curvatures, strictly considered, are approximate beyond that point, they prove to be generally satisfactory in practice. Large numbers of hypoid pairs, with both members of the pairs being generated have been produced in this way.

The bulk of recent automotive hypoid gears are formate gears, where the nearly flat gear member is cut without generating roll, and where the formate pinion is generated directly conjugate to the gear by a tool which represents a tooth side of the gear. In general the two sides of a tooth space are simultaneously cut on the gear, and in separate operations on the pinion.

Cutting both sides of a tooth space simultaneously on the pinion as well as the gear is also possible, provided that the gear blanks are designed for it. This is expected to come into wider use in the future; and this is where the helical generation of hypoid pairs will find its use, where both members of the pairs are generated. Its absence of limitations is then of increased value.

Tapered Pinion and Helical Segment

The above analysis also solves a problem which, though not of wide importance, is interesting, namely how to design and make a drive consisting of a pinion and a helical segment, whose axes are disposed at an angle to one another. It is treated like a hypoid problem, with limit pressure angle, lengthwise curvature, and all.

The kinematic pitch angles γ_k, Γ_s are obtained by geometrical addition, as on hypoid gears. The lead L, and the shaft offset $(E_p + E_s)$ may be given.

From Fig. 23

$$OG = E_p\,\omega' \cos\gamma_k = OZ\cos\Gamma_s + YZ\sin\Gamma_s$$

$$= E_s\,\omega_s\cos\Gamma_s + \frac{L}{2\pi}\,\omega_s\sin\Gamma_s$$

$$\frac{E_p}{\tan\gamma_k}(\omega'\sin\gamma_k) = (\omega_s\sin\Gamma_s)\left(\frac{E_s}{\tan\Gamma_s} + \frac{L}{2\pi}\right)$$

$$\frac{E_p}{\tan\gamma_k} + \frac{E_p}{\tan\Gamma_s} = \frac{(E_p+E_s)}{\tan\Gamma_s} + \frac{L}{2\pi}$$

$$(19)\quad E_p = \frac{\sin\gamma_k\sin\Gamma_s}{\sin(\gamma_k+\Gamma_s)}\cdot\left[\frac{(E_p+E_s)}{\tan\Gamma_s} + \frac{L}{2\pi}\right];$$

$$E_s = (E_p+E_s) - E_p$$

These formulas apply also to zero shaft offset $(E_p + E_s)$.

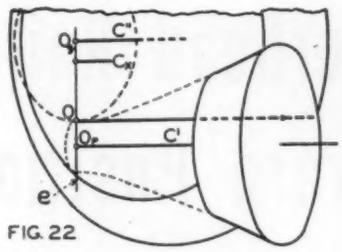


FIG. 22

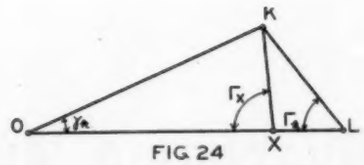


FIG. 24

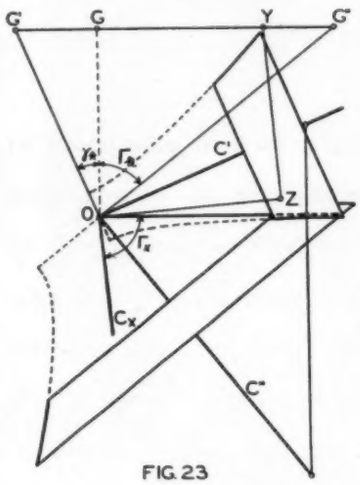


FIG. 23

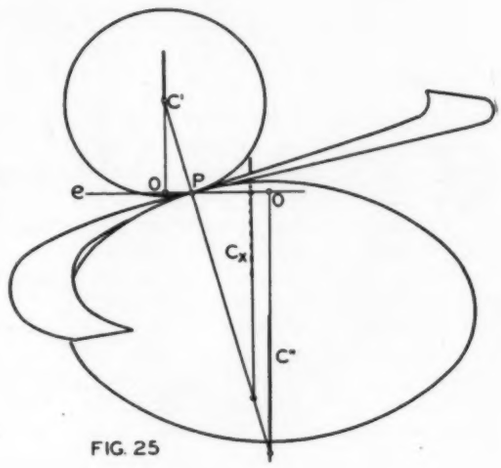


FIG. 25

Fig. 22—Kinematic pitch surfaces of a hypoid-gear pair and the instantaneous axis OP and axis C_x of a conjugate helical segment, which can be used as a basic member for generating the gear pair. Fig. 23—The position of axis C_x along line e of Fig. 22 may be determined from the diagram in this view of kinematic pitch surfaces in a direction perpendicular to their axes. Fig. 24—Turning ratio of a conjugate helical segment may be determined from this diagram by a geometrical addition. Fig. 25—Pitch surface of a conjugate helical segment whose axis is C_x in this view along the instantaneous axis of the kinematic pitch surfaces

Rollers on Helical Surface

When point Y, Fig. 23, coincides with point G', then the lead about the instantaneous axis is zero, and pure rolling takes place.

In this case $OY = OG' = E_p\,\omega'$.

The angle between OG' and the direction of axis C_s of the helical surface is $(90° - \Gamma_s - \gamma_k)$. It is a positive angle when the line drawn through O parallel to C_s passes to the left of point G'.

$OY = OG'$ can be resolved into a component $OG'\cos(90° - \Gamma_s - \gamma_k)$, parallel to axis C_s, and a component $OG'\sin(90° - \Gamma_s - \gamma_k)$ perpendicular thereto. The first component is $\frac{L}{2\pi}\omega_s$, and the second one $E_s\omega_s$. Hence

$$\frac{L}{2\pi}\omega_s = OG'\sin(\Gamma_s+\gamma_k) = E_p\,\omega'\sin(\Gamma_s+\gamma_k)$$

$$E_s\,\omega_s = OG'\cos(\Gamma_s+\gamma_k) = E_p\,\omega'\cos(\Gamma_s+\gamma_k)$$

This can be transformed into

$$(20)\quad \frac{L}{2\pi} = (E_p+E_s)\cdot\frac{\sin\Gamma_s\sin(\Gamma_s+\gamma_k)}{\sin\gamma_k + \sin\Gamma_s\cos(\Gamma_s+\gamma_k)} = (E_p+E_s)\tan\Gamma_s;\ E_p \text{ see (19)}$$

$$(20a)\quad \Gamma_s+\gamma_k = 90°;\ \frac{L}{2\pi} = (E_p+E_s)\cdot\frac{\sin\Gamma_s}{\sin\gamma_k} = (E_p+E_s)\operatorname{ctn}\gamma_k$$

The above defined helical pitch surface, and the corresponding pitch surface of the pinion or roller, give rolling contact all along the straight line of contact, which is the instantaneous axis.

True and full rolling contact is therefore not confined to cylindrical rollers engaging cylindrical or plane surfaces, and to conical rollers engaging conical or plane surfaces, but can also exist between rollers and helical surfaces. The roller surfaces are then hyperboloids, like the kinematic pitch surfaces of hypoid pinions.

The helical surfaces of constant lead here defined are the only ones capable of having pure rolling contact along a line with a surface of revolution. An offset $(E_p + E_s)$ of the axes is required for pure rolling.

Overhead Rails Overcome Awkward Positioning of Drills

BY LEON MOORADIAN, ASSISTANT RESEARCH ENGINEER, BOEING AIRCRAFT COMPANY

TIRING WASTE MOTION and its attendant retarding of operator efficiency led to development of overhead-rail sensitive drilling machines to replace carriage machines. The units were originated for drilling, reaming, countersinking and similar operations on sheet and plate parts for B-29 *Superfortresses.*

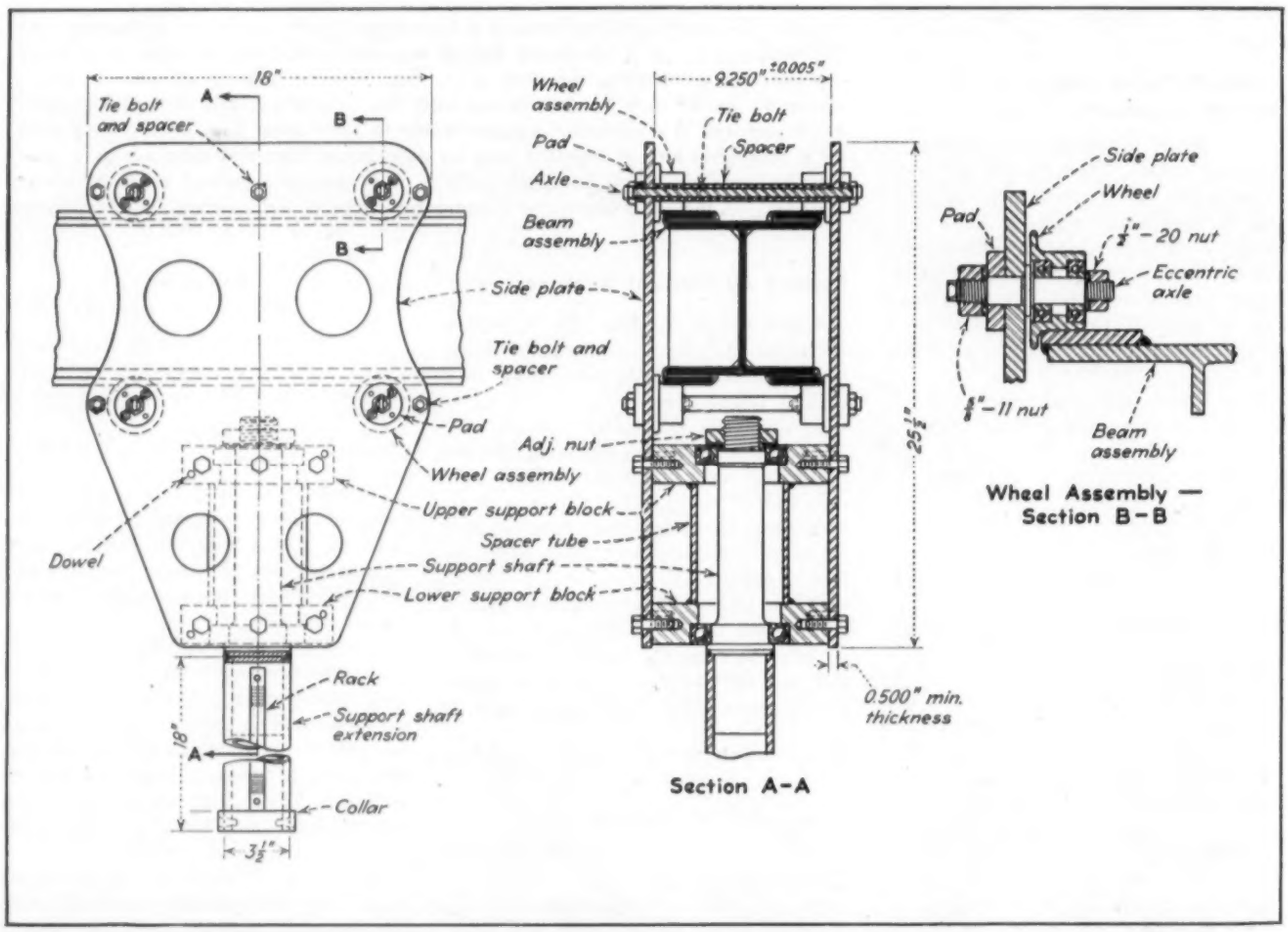
The carriage units had rails on either side of the work-supporting table, making it necessary for operators to lean across to reach drill-

Accurate vertical adjustment of drillheads can be accomplished by operators without a lot of wasted motions formerly demanded by the carriage machines

heads. Carriages on overhead rails allow operators to stand close to the work instead of leaning precariously.

One or two carriages are suspended from the overhead-beam assembly. Welded steel leg assemblies at each end of the beam are on 144-in. centers, leaving about 130 in. of free track between. The bottom of the beam is 72 in. above the floor.

Each carriage is made of two 18x25½-in. steel sideplates separated in the lower section by the heavy support-block assembly and in the upper section by five tie bolts having 9¼-in. long spacers that are con-



The drillhead carriage is made up of two 18 x 25½-in. steel side plates separated 9¼ in. so the wheel assemblies will ride properly on the 8½-in. wide and 8¾-in. deep H-beam assembly which is supported at either end by welded tubular steel-leg assemblies

structed of ½-in. standard steel pipe.

Each sideplate carries four ball-bearing wheel assemblies, two above and two below the support beam. Each wheel is mounted on an eccentric shaft which allows for a maximum vertical adjustment of 0.140 in., as the portion of the axle shaft carrying the wheel is 0.070 in. off center from the axle section extending through the sideplate and pad.

Wheels Bear Flanges

Wheels are 2 in. in dia., with a 3-in. flange, and are 1½-in. long. They are counterbored at each end for a press fit on the outer races of the two ball bearings in each assembly. Eccentric adjustment permits accurate setting of the carriage in relation to the beam so the drill support shaft is kept vertical. This also allows individual wheel adjustment to compensate for wear.

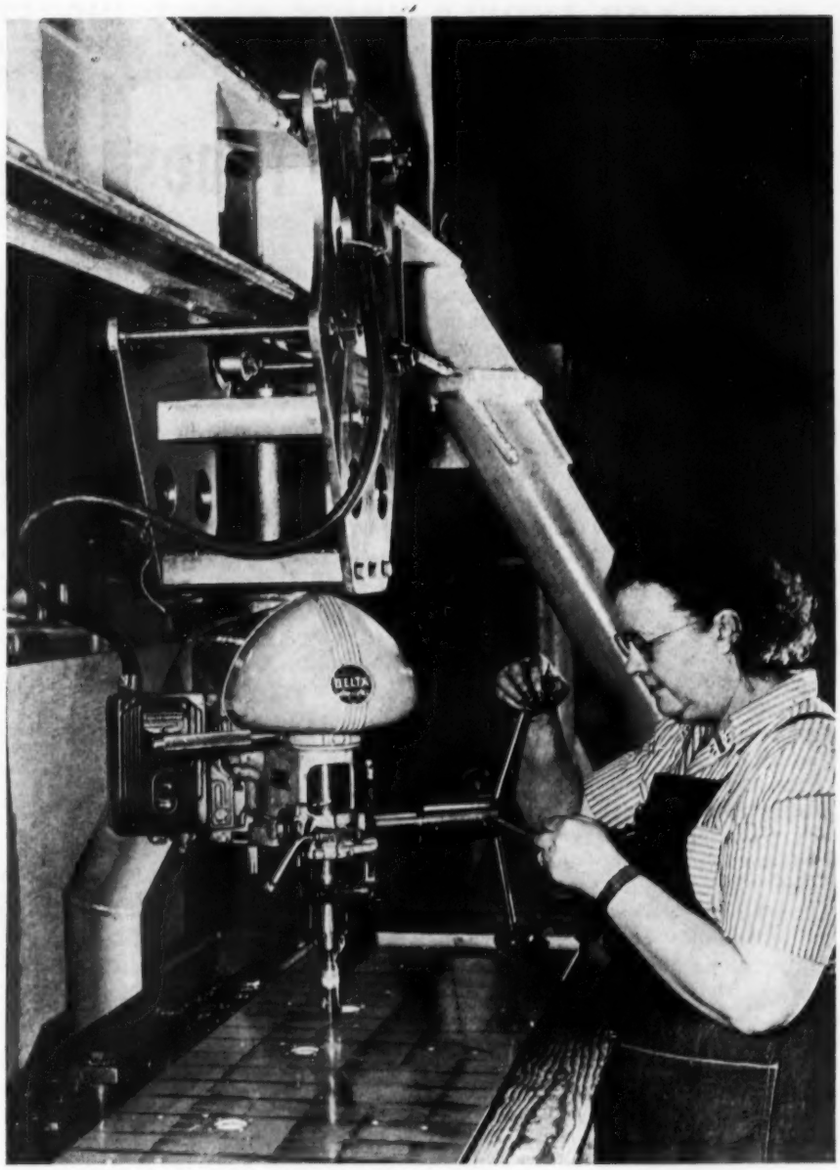
The support-block assembly for the vertical support shaft is made of an upper and lower steel block separated by a 6½-in. long section of 5-in. steel pipe. The three units are welded together and normalized before machining. Support blocks are held to a length of 9.250 in., plus or minus 0.005 in., so they bolt tightly to each of the upper-section sideplates.

The vertical support shaft within the support-block assembly is carried in two heavy-duty, radial-thrust ball bearings. A nut at the upper end of the shaft has spanner-wrench holes for bearing adjustment. A ⅛-in. washer under the nut confines clamping pressure to the inner race of the upper ball-bearing assembly.

Seamless Tubing Used

Design of the vertical support shaft with an extension made from an 18-in. long section of seamless-steel tubing is followed when the carriage is made for a 17-in. Delta drillhead with a rack and pinion raising mechanism. The steel shaft extends 4 in. into the tube extension. The welded joint is turned flush and the support-shaft extension is finish-ground to a diameter of 3½ in. to suit the drillhead. At the lower end of this extension is a collar made from a 1-in. length of 3½-in. extra-heavy steel pipe. It is joined to the extension tube with two No. 5 taper pins. A 16½-in. length of 0.75-in. wide and 0.50-in. thick standard 12 D.P. rack is bolted to the side of the support-shaft extension.

When a 14-in. Delta drillhead is used, the support shaft is a one-piece steel unit which extends about 12 in. below the lower ball bearing in the support-block assembly. The lower end of this shaft is ground to a diameter of approximately 2¾ in. to suit the drillhead.



Overhead-frame traveling drills employing Delta drillheads were used extensively in Boeing's Seattle and Renton plants for drilling, reaming and countersinking parts for the Boeing B-29. They are easier to use than conventional carriage plate drills because the operator need not lean over the carriage tracks. Support wheels on carriages can be adjusted individually on eccentric axles

As indicated, the support-beam assembly of the overhead support frame for this drilling machine is made from a 150-in. length of 8 x 8-in. standard 32.6 lb. per ft. H-beam with ¼-in. thick gusset plates on 18-in. centers welded in the channels. This beam assembly is welded complete and normalized before machining. Two track strips, each ⅝ x 3 in., are welded to the outer edges of the top and bottom surfaces of this beam. The track strips are then machined on the exposed surfaces to fit the wheel assemblies on the drill carriage. The outer corner of each of these strips is machined to a ⅛-in. radius so that it conforms with the flange on the ball-bearing wheels. The beam assembly must be leveled in both directions when installed so drillheads on the carriages will be positioned accurately at any point along the beam assembly.

Mercury-pool Tubes

"MERCURY-POOL" TUBES are the third type of electronic rectifiers. These tubes are commonly known as "ignitrons" and "multi-anode tanks" and are capable of handling the tremendous currents required in the large power field.

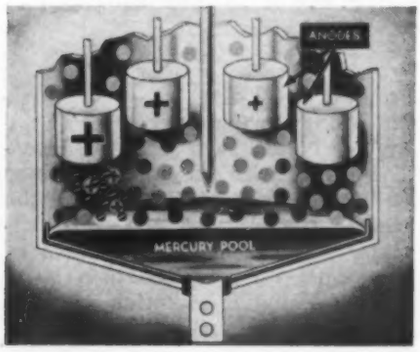
The cathodes of these tubes, instead of being rigid metal, are pools of mercury. Mercury is desirable for this purpose because its vapor is easily ionized, and the pool furnishes an almost inexhaustible supply of electrons.

An "ignitor" is added to start electron emission, giving one of these mercury-pool tubes its name, ignitron. The ignitor is made of a semi-conducting material, such as boron carbide.

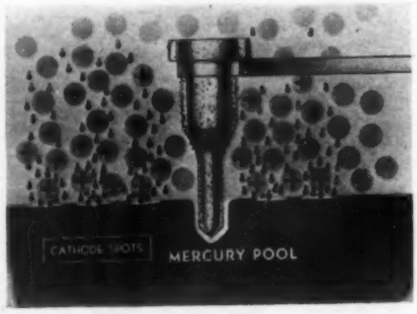
Although the ignitor dips part way into the mercury pool, the rough surface of the ignitor makes a poor electrical contact with the surface of the mercury. Accordingly, when a momentary positive voltage is applied to the ignitor, minute arcs or sparks are created along the surface of the ignitor at the many small points of separation between the ignitor and the mercury pool. These small arcs provide the initial electrons which are drawn toward the positive anode, striking mercury-vapor atoms and ionizing them as in the phanotron.

These ionized vapor atoms simmer over the surface of the mercury pool and create many "cathode spots." These are small, intensely positive fields at the surface of the mercury. These spots emit an abundant supply of electrons which stream to the positively charged anode in quantities sufficient to handle large currents.

When the anode loses its positive voltage, as it does 60 times each second on most ac. circuits, de-ionization occurs. That is, the flow of electrons stops and the ions and electrons combine into neutral atoms. When the anode again becomes positive, no current will flow until the ignitor is fired again. This dependence on the ignitor to start electron or current flow in an ignitron provides a means of starting and stopping the large flow of current in the tube by regulating only the small power needed by the ignitor. All ignitrons operate on the principles diagrammed.



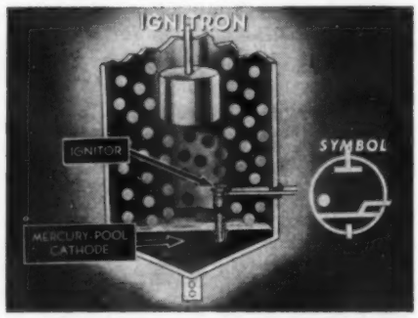
Multi-anode tanks are started by dipping a charged rod into the mercury. As one anode becomes less positive, another picks up the current flow



Positive voltage applied to the ignitor produces small sparks which caused ionized vapor atoms, called "cathode spots" to simmer over the surface

Commercial ignitrons include such refinements as water jackets which remove the heat generated when tremendous currents are handled. Larger sizes have de-ionizing grids surrounding the anode, and baffles over the mercury-pool cathode to direct and control the flow of ionized vapor. The largest sizes have removable covers to permit maintenance and repair, and are connected to vacuum pumps operating continuously.

Ignitron rectifiers are available in a range of sizes and capacities from a sealed tube to the large tanks used for industrial dc. requirements. We find these ignitron tubes deep under the surface of the earth, serving in portable substations to supply the dc. to run mine locomotives. Large tubes are installed in ignitron rectifiers that furnish more than 90% of all the rectified current used in the U. S. to reduce aluminum and magnesium.



The symbol at the right indicates the ignition tube in electrical circuits

When still greater power and higher dc. voltages are needed, the multi-anode tank is used. These giant tubes are rated from 1,000 to 3,000 volts and are capable of carrying currents running from 100 to 3,000 amp. They are similar in most respects to the ignitron. However, the tubes have more than one anode, as their name indicates, and a different methods is used to start the cathode spots.

In the multi-anode tank, the electron flow is started by dipping a rod, positively charged, into the mercury and drawing it out, to start a small arc and thus create the first ionized atoms.

The single mercury pool acts as a common cathode for all the anodes, which successively draw the load current. As one anode becomes less positive, another one picks up the current flow. With these multi-anode tanks, elaborate baffling is needed between the anodes to prevent current flow and short circuits between them. This increases the voltage drop. However, this is not so important at the higher voltages at which these tanks are used.

Large ignitrons and multi-anode tank rectifiers, with their ability to carry huge currents at higher dc. voltages, supply the dc. power needed to operate modern electric transit systems and for some of the heaviest duty jobs of industry.

Based on a sound slidefilm in the General Electric industrial electronics course.

Practical Ideas

HAVE YOU A PRACTICAL IDEA?... If so, send it in. Your idea will help other men, in other shops, who have a problem similar to yours. We pay for acceptable contributions prepared exclusively for this publication

Ball-Pin Gage Lays Out Difficult Sine Bar Work

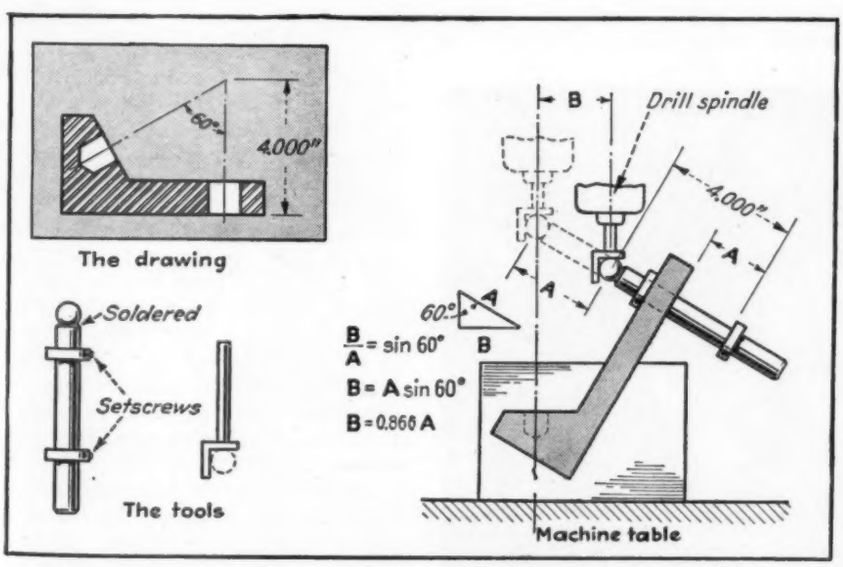
F. A. DOWLER

The problem: Drill two or more non-parallel holes to close specification. The solution: Drill one hole and insert spherical gage. Now, vertical and horizontal measurements can be made on the ball and the correct angle adjusted using the sine of the angle.

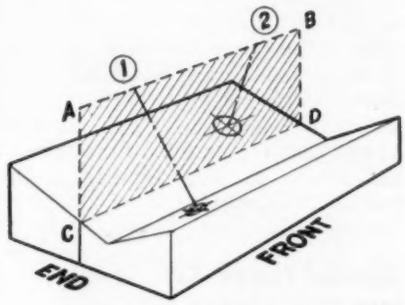
Several simplifications and assumptions are made here in order to illustrate a typical case. A drawing provides the necessary information, possibly as in the sketch below. How the distances are measured is left to the reader; it may be with gage blocks, height gage or the machine-feed micrometers. The work can be performed on a boring machine, drill-press, milling machine or lathe.

The tools consist of a steel ball soldered to a drill-rod shank and a right-angle block mounted on an arbor. The axis of the arbor must pass through the center of the ball.

The ball-pin construction is so simple that a set of rods of the frequently used drill sizes can be quickly and inexpensively made. One end of the rod is countersunk, ball and rod are thoroughly cleaned, tinned with half-and-half solder and sweated together with a torch. (Accurate countersinking assures that the ball is centered on the rod.) For convenience the ball might as well be an even diameter near that of the rod. Assume, for instance, in this case, ⅜-in. holes are called for. A good ball size would be 0.400 in. or even 0.500, a half-inch in diameter. Two adjustable collars are provided. The hole which is perpendicular to the base is drilled first, and the work mounted in an adjustable-angle fixture at nearly the correct angle (in this example, 60°) by any simple means at hand.



Steel ball soldered to a drill rod becomes handy gage for angular measurements. An angle block whose arbor axis is centered on the ball fits in the machine spindle and makes a universal joint by which the spindle is adjusted for the next hole. The small triangle shows the necessary measurements and how the angle is obtained



Another possible application of the ball-pin gage is a job like this where the angular holes do not intersect

Now the ball pin-gage is inserted in the hole and the angle-block in the drill chuck. The lower collar is set so the center of the ball becomes the intersection of the axis of the two holes (in this case 4.000 in). The upper collar (which could be a fixed flange) is set anywhere near the head of the pin. Distance *A* is the amount the pin can travel between stops.

In the sketch of a small triangle indicating the setup, *A* becomes the hypotenuse and the unknown distance, *B*, the horizontal travel of the machine spindle relative to the work to locate the spindle on the ball at both extremes. Since $B = A \sin 60°$ and we want to set 60° very accurately, we look up the sine of the angle which is 0.866 in this case. B then equals 0.866 A. The position of the work is adjusted and the ball moved back and forth and the travel noted until the table micrometer measures just 0.866 A. The

4.000 in. and the *A* dimension remain fixed, of course, but the work moves around which necessitates a couple of trials. Finally, with the ball at outer position, the spindle is at the proper angle with the work, and on the axis of the whole.

The method has many possibilities. The holes don't have to intersect at all. Suppose hole *1* and hole *2* are each not at right-angles with the base, viewed from the end, but are at right angles in the front view. The line, *AB*, which is parallel to the front edge of the piece, intersects the axes of both holes and distance *1-2* is known. The height to *AB*, the distance *AC* is given as before, as well as the two angles. The procedure is the same—the only addition is the traverse, *1-2*, each time.

Elliptical Flanges Cut With Tilting Table

H. FERRIOT
Delta Shipbuilding Company

An oxy-acetylene circle-cutting machine has here been modified by the addition of an inclinable worktable. The plate to be burned is mounted on this, and the angle adjusted to make the proper ellipse. Adjustment of the radius arm with respect to the center of the worktable establishes the minor semi-axis of the ellipse. The angle of tilt then fixes the major semi-axis automatically. As the burning machine travels around the track, the torch must be raised and lowered to maintain the proper distance from the work.

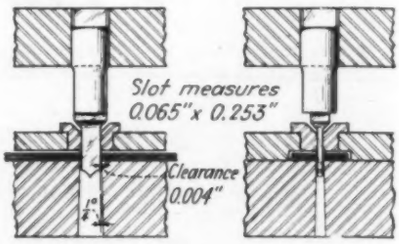
By making the center table inclinable, elliptical flanges and butterfly valves are now cut on this circle-burner

Special Developments Solve A Difficult Punching Problem

H. R. HAGEMAN

Three million slots had to be punched in 3/32-in. cold rolled steel. These slots were 0.065 × 0.253 in. which makes the slot 50% narower than the thickness of the stock. The material was subsequently formed and then chromium plated and it was vital to keep burrs to a minimum because the fin-like projections caused rapid building up of the plating metal, which in some cases almost closed the slot. If burrs did not close the slot more than 0.004 in. after the forming operation, the piece was acceptable.

The punch and die clearance was cut down from the usual 10% to 0.004 in. all around and the die relief made ¼°. The punch was made from high-speed steel and a special alloy was selected for the die; both were finish-ground after heat treatment. Punches were reground after every 20,000 pieces, which allowed about 5 grindings (total life, 100,000 pieces), to keep them sharp and avoid burrs. The working length of the punches was kept as short as possible, only ⅛ in. was allowed for grinding. A hardened steel accurately aligned bushing in the stripper protected the



This is virtually "driving a straw through the fence-post" in other words, a successful solution to one of those can't be done problems. Here, the stock is 50% thicker than the punch

punch and prevented possible buckling. The double-curved edge on the punch was selected and found successful because it combined the advantages of plain square punches and the chisel edge type. The sharp point would pierce the stock initially with comparatively little pressure and without side slip, shearing the sides of the slot at an angle, then punching the ends clean and square. The cylindrical section of the punch was a light drive fit in the pad and the square end slightly tighter. A shoulder was provided for removing the punch without affecting the cutting edges.

Sheet-Metal Edges Burred With Drill Adapter

J. A. HAMM
Convair, San Diego

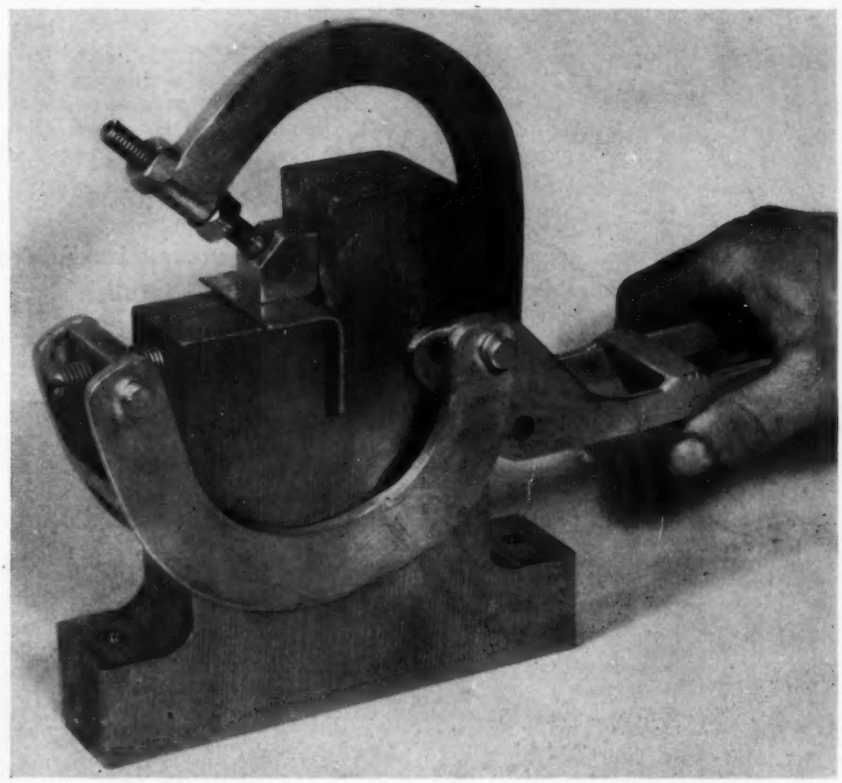
Considerable time in burring the edges of sheets is being saved, especially over hand filing, by the use of this tool. Two cutters, both driven by a geared head, are tapered, hence, there is a V-groove between them. A plate, through which the cutters project, can be adjusted axially by two supporting bolts and its position determines the effective width of the groove between the cutters as well as the depth of cut, the plate acting as a stop. This provides a means for accommodating the tool to various thicknesses of stock. In the form shown, the tool is adapted for use on a portable electric drill and can be moved along a sheet edge that is either straight or curved. If preferred, however, the tool can be arranged for driving by a fixed motor, in which case the sheet would be moved along between the cutters instead of moving the cutters along the sheet.

Double Toggle Clamp Holds Light Angles Two Ways

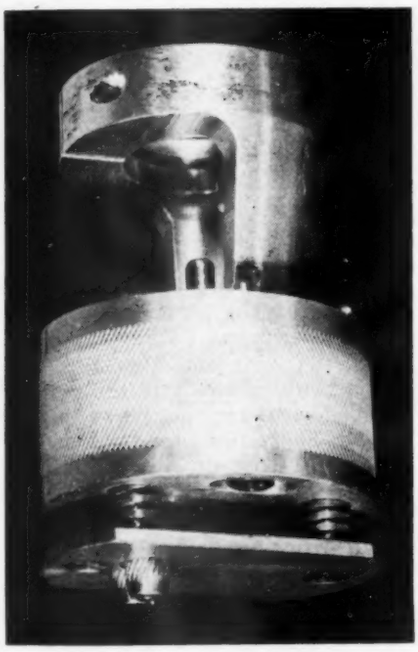
WELDING W. BOWLUS
Convair, Ft. Worth

Two C frames actuated simultaneously grip light material in two directions. The handlever turns on a pin driven through the hardwood frame and has two sets of pins for moving the two C's. The lower C pushes a screw horizontally through a bushed hole in the block to clamp the plate horizontally, while the upper C brings a floating block down on the part at about 45°. Both have setscrews to adjust for thickness of stock and to regulate the clamping pressure.

The clamp is fast-acting and affords plenty of working clearance. It has proved valuable with a variety of fixtures.



Clamp in closed position. Notice the alignment of the pivot pins in the handle: The one at the apex is the handle pivot, each of the other two is just past the center line of its pressure axis, indicating that both toggles are locked

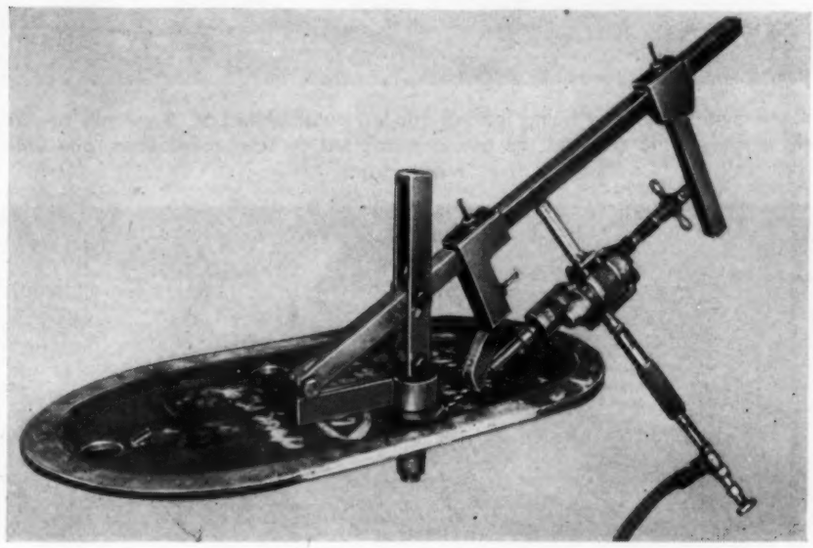


Geared head clamps to portable drill for rapid burring of thin plates. Adjustment of lower plate up or down controls the width of the groove because of the tapered cutters

Built-Up Fixture Guides Drill At Any Angle

LEWIS J. STIBITS
Navy Yard, Philadelphia

The operation for which this fixture was developed was the drilling of oblique packing holes in watertight doors. The unit fastens to the door through the hole for the securing dogs; it guides the drill and supports the air motor in correct alignment; it provides feed by means of a screw handwheel. No particular placement of the work is necessary; it can be drilled in any position. The frame is hinged and different sets of holes provided to construct the different angles commonly required. The brackets are adjustable to take various types of drill motors. *Suggestion submitted under the Navy Employee's Suggestion Program.*



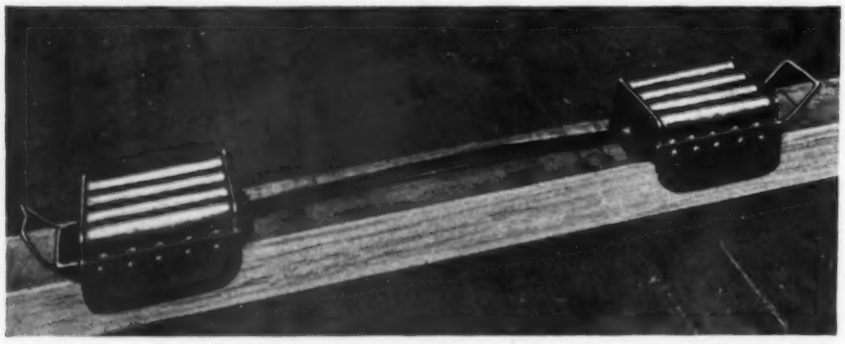
Oblique holes are drilled with pneumatic tool supported in this adjustable fixture, which has a drill bushing at one end and a ball pivot at the other

Crossed-Eyed Dollies Speed Car Loading

Boxed aircraft engines, weighing about two tons each, are now loaded into freight cars in less than a third the time formerly required. Two pairs of roller dollies are employed. Each unit has nine rollers; the five lower ones roll in one direction, and the four upper ones roll at right angles to the lower ones. Wooden rails are laid on the car floor and a pair of roller units is placed on each rail, separated by a long link. The box is placed on the four units with a fork truck and then is rolled to the end of the car, rolled sideways and shifted to the sleepers with a hand pallet truck.

It formerly took six men about 32 min. to load seven engines into a car, using skids and crow bars. Now, four men do the job in 8½ min. with much less effort.

Boxed aviation engine being loaded into an automobile car. Two rails are laid the length of the car and the box is supported on four roller units, one under each corner

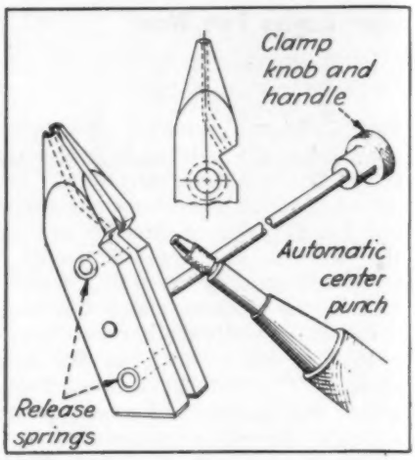


Link bar and two handles permit the pair of roller units to be pulled in either direction along the wooden rail

Compact Thermocouple Staking Tool Works in Confined Locations

FRANCIS ELTON FARLEY
Douglas Aircraft Company, Inc.,
Santa Monica

To install thermocouples at internal test points in aircraft structures, large holes often have to be cut in the skin surface to gain access for the conventional staker. The size and simplicity of this two-piece tool eliminate this successfully.



Thermocouple leads fit the groove shown dotted, while automatic center punch stakes the couple in place

An automatic center punch is used as the driver with a flat, channeled tip substituted. The thermocouple vise has two symmetrical halves with a groove for the wire terminating in the countersunk tip at one end and an oblique notch at the other. Two internal coil springs provide the releasing force, and a long-handled screw does the clamping and then acts as the holder. The center punch tip is placed over the wire where it emerges from the vise and the flats bear against the notch, but the wire is not affected by the blows of the punch. *Suggestion from the Board for Individual Awards, War Production Drive.*

Rigid Arbor Converts Drill Press Into Boring Mill

ORVILLE E. HYLER

Work whose dimensions or weight prohibit setting up in small lathes, or when other facilities are busy, may be successfully turned using a heavy-duty drill press.

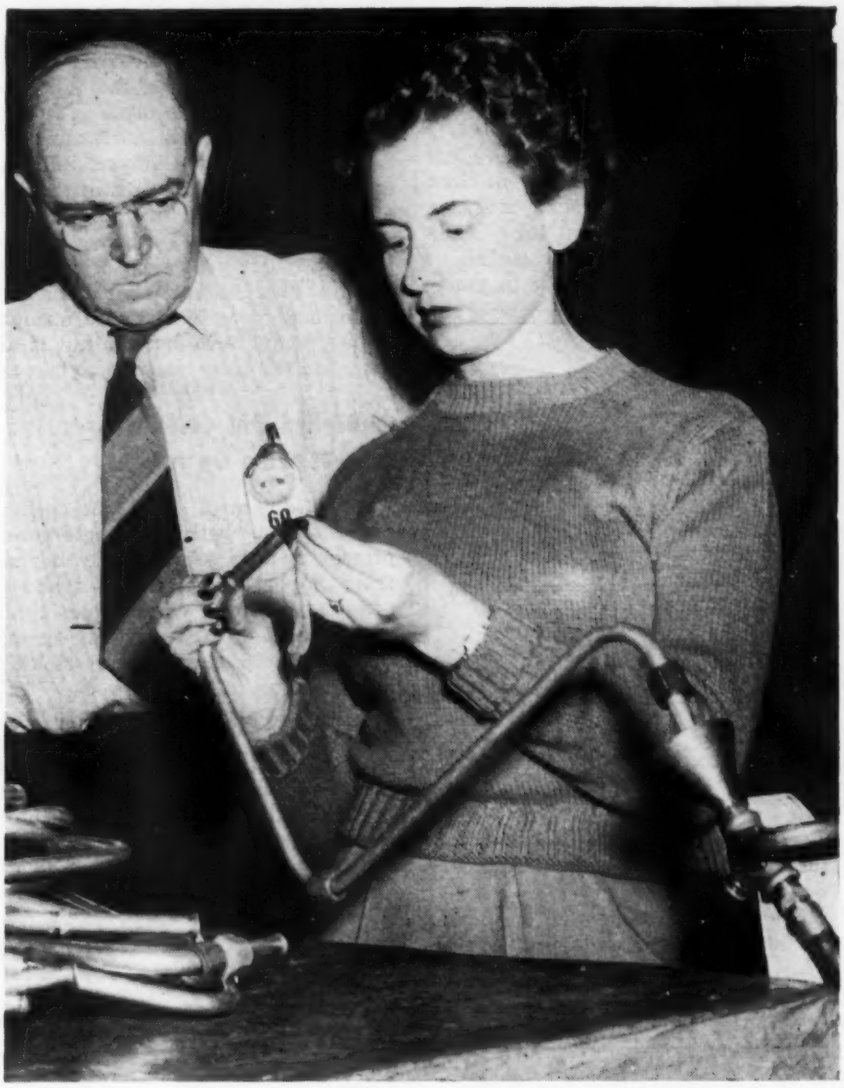
To minimize whip, the boring bar slides in two hardened steel bushings. The upper bushing is supported by a bracket attached to the drill column. The lower one is mounted in the hole in the drill table. Both attachments are made with capscrews and dowels for accurate alignment and quick installation and removal.

In the setup illustrated, the bar carries four toolbits, here shown in one plane for clarity. The bits are

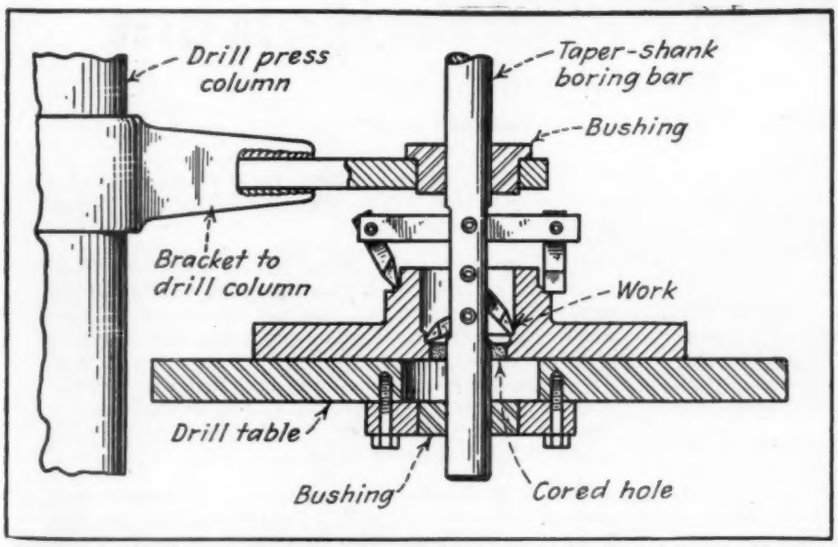
set and spaced to take rough and finish cuts with the slightest possible lead, so both the hole and the boss are finished in a single operation.

In this case, the bracket which supports the upper bushing is hinged to simplify tool changes. Actually, the bracket is necessary only for the heaviest work; it can be omitted most of the time.

This setup is schematic; no attempt has been made to show the many possible variations of the idea.



David MacKenzie instructs a girl in the operation of his vacuum shuttle for cleaning tubes



Here, a boring bar supported at three points in a drillpress finishes a hole and its boss at a single cut

Suction-Pulled Swab Cleans Tubing

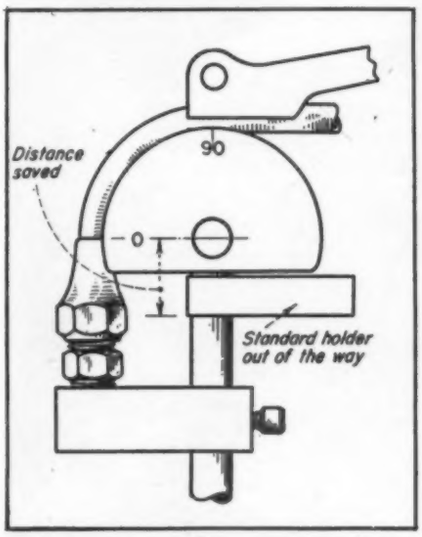
DAVID D. MACKENZIE
Bell Aircraft, Georgia Division

Bent tubing used for wiring assemblies is cleaned inside by pulling a fabric swab through from end to end. Formerly, the cord used to pull the swab through was first shot through by a jet of air. For fairly long tubes, a girl at one end shot the cord through and a girl at the other end attached the swab which the first girl then pulled back through the tube. Now the job is done much faster by connecting the tube to a vacuum line. A flexible shuttle that fits the tube is attached to the swab. When the shuttle is placed in one end and suction applied at the other, the shuttle and swab are pulled through with almost lightning speed. No cord has to be inserted or pulled. Girls now do the cleaning far faster on long tubes. One girl usually loads the shuttle and the other applies the suction. Then the other loads the shuttle in the next tube and the first applies suction. This avoids many motions. The shuttle is made by threading a series of felt washers and leather cups about the size of the tube bore, over a short flexible wire or thong forming a loop at one end for the swab. Suction is applied by a rubber funnel on the end of a length of flexible hose connected to the vacuum line. The end of the tube to be clean is placed in the funnel and a thumb valve tripped instantly pulling the shuttle into the funnel. Then the valve is released and the swab removed by hand. Swabs are of cheesecloth and usually are moistened with solvent.

Tube Bender Attachment Makes Closer Bends

CLARENCE COOTZ
Grumman Aircraft Engineering Corp.

Tubes leading away from the *Hellcat* instrument panel had to be bent close to the sleeve nut because of space limitations. Conventional tube benders with a holding clip waste about ½ in. when the tube nut is in place.



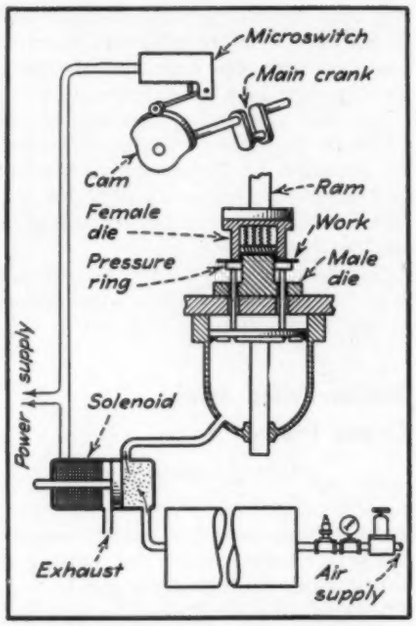
Tube bends near the connecting fitting are made faster and closer with a sliding-block attachment on the bender into which the male part of the connector is screwed

This was avoided by clamping a block on the shaft of the bender which carries the male part of the tube connection. With the tube nut screwed up tight, the block is slipped up the shaft until the nut touches the radius. Here it is clamped, and the finished bend begins right at the end of the nut. Further, this method saves assembly time (even when clearance is not a major problem), because the cutting and flaring operations are performed more easily with straight tubing. After bending, the nut is already on the tube ready to couple up.

Controlled Die Cushion Aids Drawing Operations

Automatic control of the die-cushion piston now permits single-action presses to do a job formerly beyond their scope. The piston is linked to a "pressure ring" whose chief function is to clamp the work up against the female die and prevent wrinkling and buckling of the flange.

When the press is tripped, the ram starts down. At the same time the cam closes the Microswitch, which energizes the solenoid air valve allowing air to enter the die cushion. Continuing downward motion pushes the pressure ring and piston down against the air pressure, but the large accumulator and a relief valve prevent any increase in pressure. When the drawing is completed and the ram starts to rise, the cam allows the Microswitch to open; the solenoid is deenergized and the air escapes from the cushion to the atmosphere. As the pressure ring drops back, the springs within the female die eject the finished part. A regulating valve keeps the air pressure at the correct value and the large accumulation absorbs heavy fluctuations.



Microswitch control permits deep drawing on a single-acting press equipped with die cushion

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Machine Tool Electrical Standards—V

THESE STANDARDS HAVE BEEN APPROVED BY THE NATIONAL MACHINE TOOL BUILDERS ASSOCIATION

Recommended Practice: It is recommended that 110-volt control be used on all a.c. powered machine tools as follows:

(a) All operating coils of magnetic devices should be connected to one side of the control circuit with provision for purchaser's grounding of that side of the line at the control circuit transformer.

All contacts should be connected to the other side of the line except as follows:

Overload relay contacts may be connected in the line having provision for grounding, if the conductors between such contacts and the coils of magnetic devices do not extend beyond the control inclosure.

(b) The wiring diagram should show the location of the grounding connection with the notation: "To be grounded by purchaser if conditions permit."

4.5.2 . . . Automotive Standard (in addition to 4.5.1)

The recommended practice in 4.5.1 is mandatory.

Also 100 volt-amp. additional transformer capacity, or a separate transformer, shall be provided on machines requiring over 2 hp. for a 110-volt machine light. Transformers shall have primary winding for dual 220/440 volts unless otherwise specified.

4.5.3 Reduced control voltages other than 110 volts may be used where sensitive instruments, electronic tubes, or similar devices are used in the circuit.

4.5.4 When a.c. reduced-voltage control circuits are required, coils having an inrush (coil current measured with the magnet blocked open) current exceeding 20 amp. shall be energized through a relay connected in the reduced voltage circuit.

4.6—Conduit and Raceways

4.6.1 Except as modified in the following paragraphs, all machine wiring shall be totally inclosed in heavy wall conduit, conduit fittings, junction boxes, or sheet-metal boxes.

4.6.2 General-purpose flexible metal conduit may be used only where necessary to employ flexible connections for small or infrequent movements, as at motor terminals, and provided that the flexible-metal conduit is not subject to oil or moisture.

4.6.3. . . . Automotive Standard (instead of 4.6.2):

Liquid-tight flexible conduit and fittings shall be used for connections involving small or infrequent movements. Such conduit shall consist of an oil-proof liquid-tight jacket or lining in combination with a flexible-metal reinforcing tubing. The fittings shall be of metal and shall not separate from the conduit under tests as prescribed by the Underwriters' Laboratories for flexible conduit. The metal reinforcing tubing shall make good electrical contact with the fittings. Such conduit shall be so installed that liquids will tend to run off the surface instead of draining toward the fittings.

4.6.4 Wiring connections to continuously moving parts of a machine tool shall be of approved type oil-resisting, extra-flexible, non-metallic covered, multi-conductor cable; or liquid-tight flexible conduit, with extra-flexible conductors.

4.6.5 Compartments or raceways within the column or base of a machine may be used to inclose conductors, provided the compartment or raceway is isolated from coolant and oil reservoirs, is entirely inclosed and conforms with the National Electrical Code. Conductors run in inclosed compartments and raceways within the base or column of a machine shall be secured and so arranged that they will not be subject to mechanical injury or abrasion.

4.6.6 When wires are adjacent to moving parts, the construction and the conductor supporting means shall be such that there will be a space of at least one inch between any moving parts and the conductors under all conditions of operation, or barriers shall be provided between the conductors and the moving parts.

4.6.7 Junction boxes shall not have extra conduit knockouts, and shall be provided with gasketed covers. All junction boxes must be oil and water tight. Fittings must have strength comparable to that of the conduit.

4.6.8 All conduits shall be securely held in place and supported at each end.

4.6.9 Armored cable shall not be used. Conduits from non-vapor-tight inclosures to vapor-tight inclosures shall be properly sealed by the use of approved-type fittings designed for the purpose, but in no case in motor terminal boxes.

5. GROUNDING

5.1—Stationary Equipment

5.1.1 All control cabinets, motors, metal conduits, control stations and other devices, where there is a possibility of contact with current-carrying parts, shall be grounded. Grounding by attaching the device to the machine tool with bolts or other approved means shall be considered satisfactory if all paint and dirt are removed from joint surfaces.

5.1.2 Where the magnetic control panel or other devices are not mounted on the machine tool, they should be grounded by the purchaser.

5.1.3 Exposed grounded control circuits may be used where the low voltage does not exceed 24 volts, and where the low voltage is insulated from the power supply by a two-winding transformer circuit. Where such circuits are used, a complete description of the circuit and the reason for its application must be presented to and permission obtained from the purchaser in writing before such circuit is used.

5.2—Portable and Pendant Equipment

5.2.1 All portable accessories or pendant stations shall be grounded to the machine so as to prevent injury to personnel.

5.2.2 The size of the grounding conductor shall be as given in the following table:

Capacity[1] of Protective Device Amp.	Copper Wire No.	Conduit or Pipe Nominal Diameter
15	16*	½
30	14	½
60	10	½
100	8	½

[1] **Capacity of automatic overcurrent protective device in circuit ahead of equipment conduit, not exceeding amperage stated.**

***Use only in multi-conductor cable.**

5.2.3 The grounding conductor for the portable or the pendant equipment shall be included as one of the conductors of a multi-conductor cable.

6. ELECTRICAL ACCESSORIES and DEVICES

6.1—Connections to Accessories

6.1.1 Where an auxiliary device must be removed under certain operating conditions, it may be connected through a plug and receptacle, providing a ground connection is used. In lieu of plug and receptacle, connections may be made to a terminal board in a junction box provided for the purpose.

6.1.2 . . . *Automotive Standard* (instead of 6.1.1)

Where an auxiliary device must be removed under certain operating conditions it shall be connected to a terminal board in a junction box provided for the purpose.

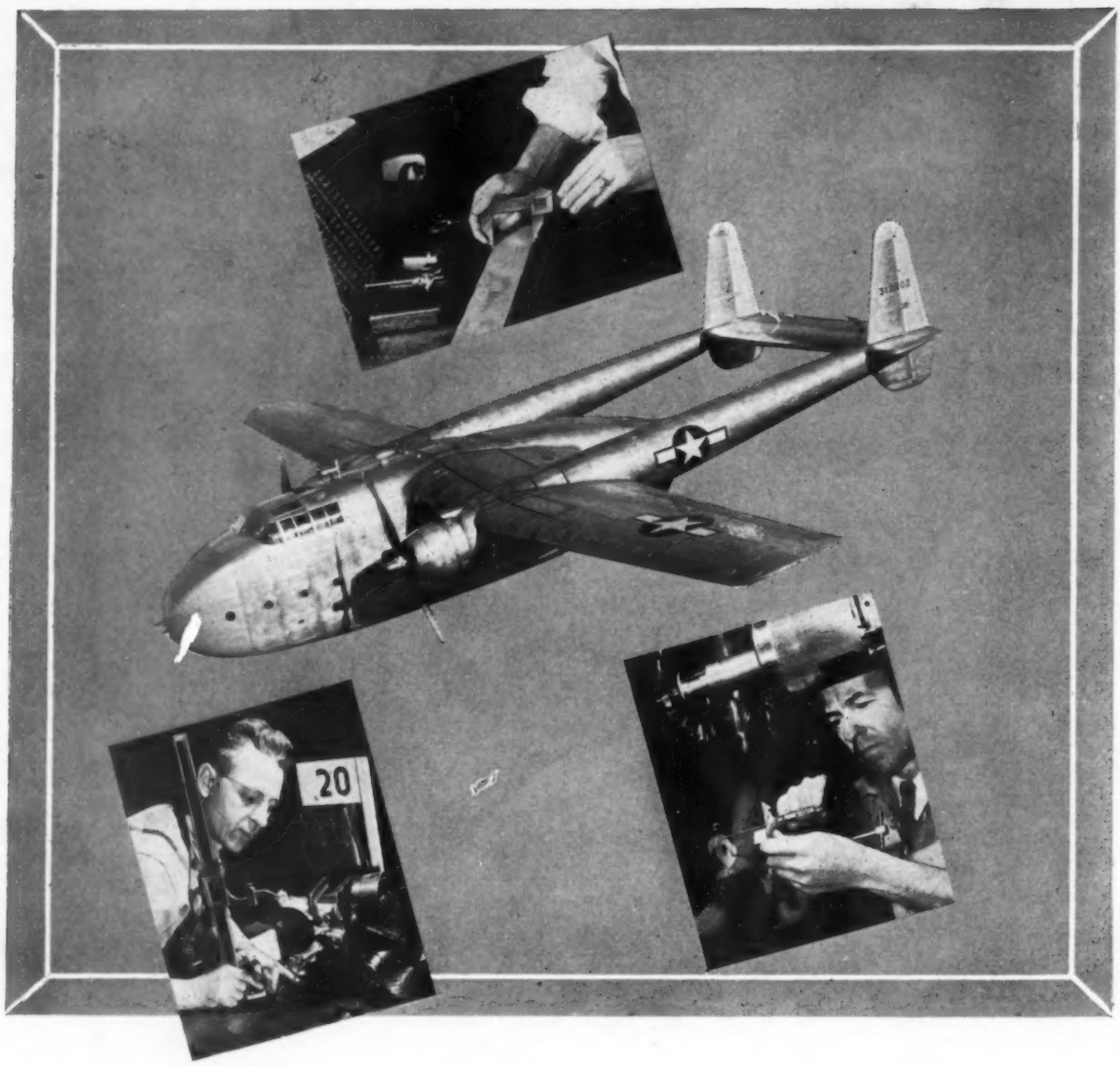
6.1.3 Plugs and receptacles shall be of locking type to prevent accidental disconnections and of a type approved for the voltage applied. They shall be provided with gaskets to prevent entrance of oil or moisture when in operation position, and means should be provided to seal the receptacle effectively whenever the plug is removed.

6.2—Marking of Devices

6.2.1 All control and power units shown on the wiring diagram shall be plainly and permanently marked with the same identification marks shown on the wiring diagram. Each limit switch or other accessory shall be marked with its number as shown in the diagram, or its position on the machine shall be shown on a diagram furnished for the express purpose of locating electrical parts. Identification markings must not be on covers of limit switches.

6.2.2 Where electrical equipment is removed from its original inclosure or where equipment is so placed that the manufacturer's identification plate is not readily visible, a duplicate identification plate giving the identical information as the original plate shall be permanently attached to the machine or inclosure and properly identify the items it describes. Identification plates must not be removed from electrical equipment.

STARRETT TOOLS



STARRETT Precision Is Part of the Picture at FAIRCHILD

Before a single ship takes wing, hundreds of precision measuring and inspecting operations must be made.

Fairchild Aircraft Division of Fairchild Engine and Airplane Corporation uses many Starrett Precision Measuring Tools as evidenced by the above pictures taken at their Hagerstown, Maryland, plant. Skilled workers at Fairchild, as everywhere, have learned that they can count on Starrett Accuracy and dependability to do better, faster work.

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Graphical Division of the Circle

BY H. W. STOWELL

A common shop problem is to divide a circle into a number of equal small divisions, either odd or even. Examples are bolt holes in gun mounts and stud holes in cylinder heads. When the pitch of the holes is not given on the drawing, the machinist may be forced to resort to tedious trial-and-error methods.

It is possible, of course, to find the side of any polygon inscribed in a circle by using handbook tables. The angle subtended by the chord between adjacent hole centers is found by dividing 360° by the number of holes, and then multiplying the sine of one-half that angle by 2 r or d. Most tables of sines express angles in degrees, minutes and seconds, giving trouble in converting to decimals. In one case, the table of sines for one-half the angle (for various divisions) is expressed in decimals. However, it is necessary to change any decimal fraction resulting to 64ths when setting dividers to a machinist's scale. Any error in setting is cumulative. For example, a setting error of 0.005 in. when laying out 31 stud holes in a locomotive cylinder created a total error of 0.155 in. for location of the last hole.

Circles and their mysteries have been studied by man for centuries. Yet it required considerable research to bring to light the following two methods for graphical division of the circle.

First method—A line drawn from the center to bisect one side of an inscribed polygon will step seven times around the circle. The sides of inscribed polygons having 3, 4, 5, 6, 7, 9 or more sides can be obtained by the construction shown in Fig. 1. Set the dividers to *AC*. Scribe *AF* and *FG*. Draw *GH* bisecting *CB*. Make $HI = HD$. The figures on the drawing show how many times the lines will step around the circle. Make arc *AJ* equal to one-third arc *AG*.

Second method—Quarter the circle with horizontal and vertical centerlines. Then, as shown in Fig. 2, divide the horizontal diameter into as many equal spaces as there are to be divisions in the circle. With *A* as the center and *AB* as a radius, strike an arc intersecting the vertical centerline at *E*. A line drawn from *E* through the second division on the horizontal centerline will cut the circumference at *F*. Then *AF* is the length of the required side.

These principles can be used in laying out the 31 stud holes in a locomotive back cylinder head, Fig. 3. The top stud hole is bisected by the vertical centerline of the stud circle, and the guide surface is square with the vertical centerline. A head strip or piece of wood is laid across the stuffing box and the center located with hermaphrodite calipers. The vertical centerline is located with square and straight edge, and the horizontal centerline by quartering the circle. The stud circle and the center in the stuffing box are not in the same plane. The trammel points are therefore set to the hypotenuse of a triangle, in which the base is equal to the radius of the stud center and the altitude equal to the drop from the stuffing-box center to the flange of the head. On Fig. 3, the pitch of the holes is given. If the drawing does not contain the figure, it will be advisable to find the side of the 31-sided polygon by Method 2. Of course, neither method is truly exact, but each serves as a rough stepping point, and the divider setting can then be corrected.

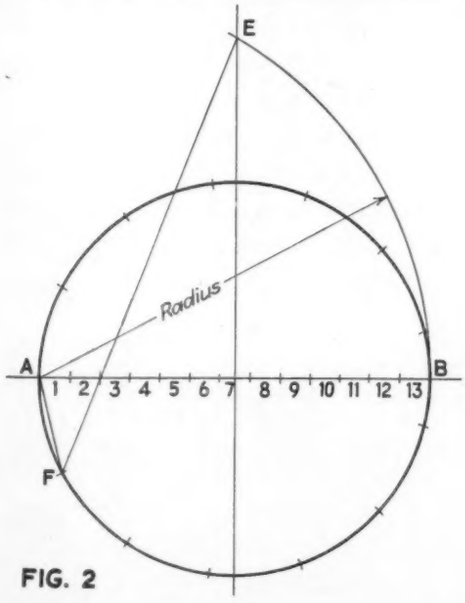


FIG. 2

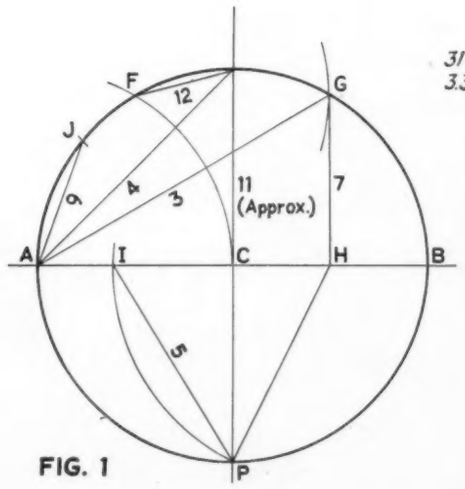


FIG. 1

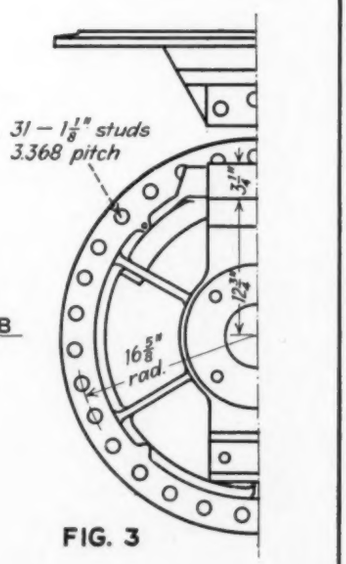
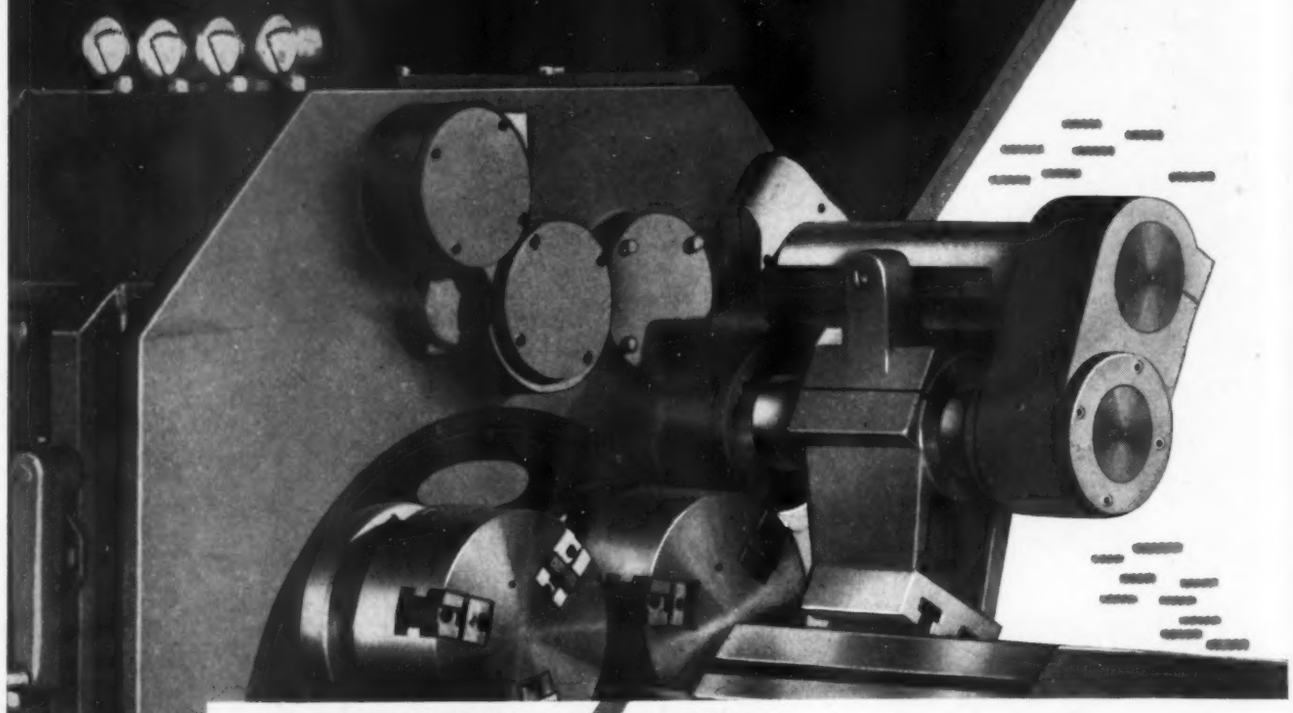


FIG. 3

The difficult and "Impossible"



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SPOT NEWS OF METALWORKING

Car to retail under $1,000 is being designed and developed by at least one automobile maker. At present costs this means use of plain carbon steels instead of alloys, cheaper textiles and trimmings, considerable weight reduction by elimination of fancy bric-a-brac, shorter wheelbase.

Substantial shrinkage of retail car market is foreseen by automobile companies unless lower-price cars can be offered. Public is sensitive to car prices, won't pay excessive sums unless desperate. Detroit believes seller's market will not last long.

Jet engines will be used in helicopters within three years. Some 200 helicopters have been produced, about a dozen firms are working on helicopters for Army and Navy. Commercial use, recently considered 8-10 years away, has been speeded by developments sponsored by armed services.

"Cold" processes of treating steel will be employed more extensively as further perfected, recent survey shows.

One newcomer to passenger car field has contracted for major parts for first 30,000 cars from outside suppliers. If car then is success, it will make many of these parts itself. It has under way major buying program to meet this contingency.

Some plastics people predict doubling of plastics production in next five years and redoubling in succeeding five years.

Britain today has no price control on following goods: machine tools, metal cutting and forming tools, testing machines, precision measuring equipment, portable tools, industrial electrical equipment, materials handling equipment. Almost all heavy capital goods are free from controls but builders must inform government of price changes.

Porcelain enameling of aluminum alloys is undergoing extensive service tests, but is not yet ready for commercial market.

International Harvester is freeing large amount of working capital for production uses by withdrawing from financing its installment sales. In 1941 it financed $105,000,000 of equipment sold to farmers.

Forty thousand workers are needed to produce gray iron castings, according to survey of 1,280 foundries by Civilian Production Administration. Average order backlog is four months, only 42% of the companies are meeting delivery dates.

Mechanical stoker industry anticipates record output this year (in 1941 it made 192,000 units). Most companies have not been affected by strikes.

Fast-drying primer paint, with a zinc chromate base, similar to that employed during war for planes, will shortly be made available for finishing aluminum buses, can be applied to other aluminum products.

Soviet's Kirov tank factory is preparing to build new 80-hp. diesel tractor with nine-speed transmission instead of four speeds of previous model.

Japan finished the war with 800,000 machine tools, compared with 150,000 in 1930 and 1,000,000 as wartime peak. China would like to secure large quantity of these tools as reparations, but if so they would go to Manchuria where skilled operators are available. With Russia in control in Manchuria, United States consent to this transfer is not likely to be given.

Britain will export 116,000 passenger cars, 35,750 trucks and 30,000 buses in first six months of this year. These figures represent one-half of total passenger car production and one-third of commercial vehicle output.

Gaging Business

Business Confidence Holds

Despite the national disruption of industry by recent labor troubles, and more recently, by the government's new wage-price formula, the basic confidence of most businessmen in general business prospects over the next few years remains unshaken. This is reflected in the quiet pushing of expansion and plant rehabilitation plans by many industries, including strike-bound and price-troubled plants. While quick resumption of many such industries depends upon quick government action on prices, industry is laying plans for the highest possible level of operations as soon as these troubles are cleared.

Reconversion progress has been set back a month or two thus far, and additional labor and price troubles may reduce this year's production further. Accordingly, estimates for 1946 output of various products all the way from automobiles to radios will have to be cut 15-20%.

Meanwhile, industry is seeking ways and means to offset higher labor costs and the latest price squeeze. One means is through better and more efficient equipment, and the machine tool industry reports a continued high level of business. Another is by eliminating unprofitable items from production schedules, and this practice is widening. A third is by farming out work to plants who can do certain operations more cheaply, and this is bringing a new surge of subcontracting throughout industry.

Tool Business Good

Machine tool shipments during January totaled $30,406,000, which represented a recovery from the December low point of $23,200,000. Moreover, February shipments are expected to be off as a result of labor trouble and material shortages in the industry, and March shipments are also likely to be hampered by the same factors. Nevertheless, the industry's backlog continues steady at around $178,500,000 at the end of January, almost equalling December's total of $178,900,000.

Foreign orders amounted to 27.8% of January's backlog, and foreign shipments for that month represented 27.4% of the total. Moreover, railroads are becoming among the most active domestic purchasers. The rails are reported to have sizable programs for new tools.

There seems to be a trend toward the greater use of semi-special tools, even in shops that are not considered specialty shops. The convertibility of such tools from one type of work to another is considered an attractive factor in their purchase.

Manufacturers of portable tools have tremendous backlogs. They expect to produce at about four times their prewar levels during the next six months.

Steel Industry Recovering

The steel industry is coming out of its shutdown faster than expected, and distributing steel to consumers on an allocation basis as best it can. Customers seemed generally satisfied even though such supplies were below their earlier expectations. Apparently, the appreciation of the production loss of millions of tons of steel makes consumers ready to adjust their own production schedules in line with available supplies. However, inventories throughout steel-consuming plants have thinned down considerably.

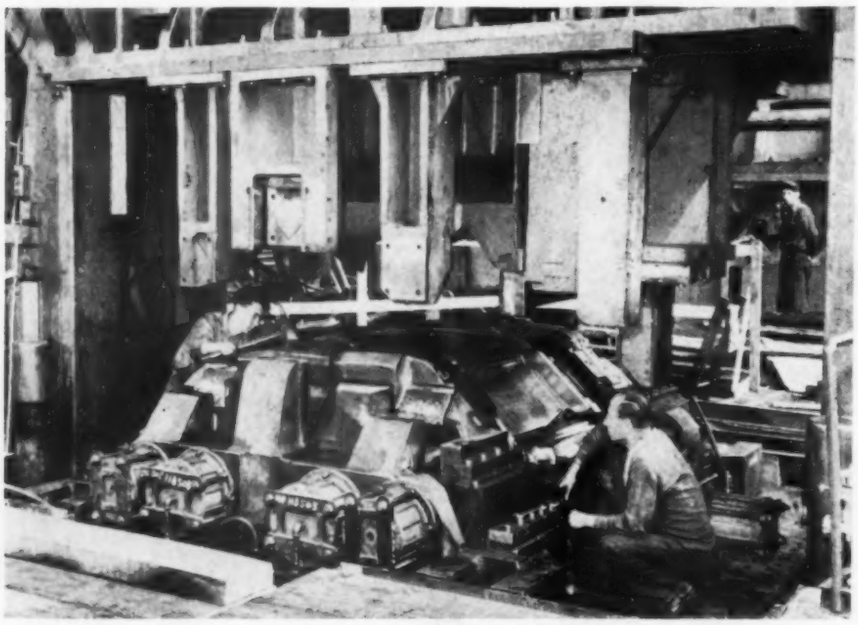
Current strikes in metalworking plants, and those during February, served to reduce the potential consumption of steel, so that pressure upon the steel industry is not as great as it would otherwise have been. Many plants, hampered by shortages of motors and electrical parts due to strikes at General Electric and Westinghouse, thus suffered impairment of their ability to consume steel.

Wage-Price Formula

The ending of the steel strike has only substituted a new major crisis for the metalworking industries, in the form of the new wage-price formula. Under it, manufacturers are supposed to grant wage increases first and appeal to OPA for price relief later. However, many plants with experiences with the OPA are apparently determined to wait until OPA price policies are drawn more clearly before settling the strikes at their plants.

Meanwhile, those plants still operating have slashed their lists of items previously produced at unprofitable prices. In the steel industry, this practice (not a new one) is being intensified, and it may become serious enough to shut off some consumers entirely from certain types of steel. Equipment makers and other metalworking plants have discontinued the production of unprofitable items.

Over-all, steel fabricators believe that by the time the OPA is through adjusting prices right along the line from the steel maker to the manufacturer of the finished product, the $5-a-ton increase on steel may be converted to a $10-$20-a-ton increase on finished products. As much as OPA may resist such price increases, they point out that each plant along the processing line must pay higher raw material costs and wages.



66-Ton Crab Die—This huge crab die (so called because of its sidewise motion) is one of seven large units the E. G. Budd Manufacturing Co. has made to form steel automobile roofs. The panel formed by this die is over 106 inches long and 61 inches wide. The die assures absolute accuracy and minimizes the likelihood of damage to the stamping which might occur if it were handled in more than one press. One of the most intricate dies ever built by Budd, it required over 15,000 man-hours to build

Cleveland Industry Disrupted by Wage-Price Problems, Material Shortages

CLEVELAND — Settlement of the steel strike left fabricators in this area faced with price, wage, and material problems that are expected to hamper these plants for some time to come.

Strike-caused material shortages (bearings, motors, electrical parts, iron and steel, and castings) had disrupted operations of foundries, machine tool builders, and other users of iron and steel. However, the new wage-price formula only made matters worse.

Tool Situation Typical

The plight of the machine tool builders is typical of the general situation. Local machine tool builders have been hit by bearings, motor, and castings shortages that have forced curtailed operations for many weeks, but the steel strike completely upset production schedules. Moreover, machine tool labor may ask for a wage increase similar to the steel workers, according to some reports, although tool builders are already up, and in many cases, beyond the 33% wage increase formula (above January, 1941, levels).

Most discouraging of all is knowledge of the usual delay of six to eight months which has accompanied price relief appeals to OPA in the past, in the light of the new wage-price formula. The fact that manufacturers must first grant wage increases before appealing to OPA for price relief adds a new element of risk to industry's price-costs planning.

Cutting Unprofitable Items

It is little wonder then that the majority of tool builders have reduced the number of their products, halting production of special and standard tools manufactured at cost or at a loss. Despite this, some machine tool plants in this area are almost completely shut down, while others are limping along on available materials, trying to stretch out the work to maintain labor forces.

Among the earliest to curtail production was The Warner & Swasey Co., which is only using 200 of its 2100 employees, and keeping its tool and planer departments going. Material shortages were responsible.

At the Foote-Burt Co., full-time employment continues but for how long is problematical, in view of lack of castings and electrical parts. Delivery on new products by the A. W. Hecker Co., builders of special tools, is hampered by castings shortages.

WAGE-PRICE IMPASSE KEEPS PLANTS SHUT

CLEVELAND — Steel processing concerns in this area tied up by labor difficulties include: Acme Foundry Corp., Atlas Bolt & Screw Co., Grabler Manufacturing Co., W. J. Schoenberger Co., Triplex Screw Co., and the Plechaty Co.

Other plants made idle by strikes include: General Motors, General Electric Co., Westinghouse Electric Co., Murray-Ohio Manufacturing Co., Elwell-Parker Co., Osborn Manufacturing Co., National Copper & Smelting Co., Cleveland Steel Products Co., National Malleable & Steel Castings Co., Titan Valve Co., Ohio Electric Co., International Piston Ring Co., Chicago Pneumatic Tool Co.

In all, about 21,524 workers in this area were on strike in early March within foundries, fabricating and electrical industries, with thousands idle because of these and other strikes in allied industries.

Van Dorn Iron Co. is down to 40% of capacity because of steel shortages.

National Acme has cut operations by 50% because of lack of castings, bearings and electrical parts. Employees will start their annual vacation season March 1st, with all vacations completed by May 1st, to alleviate present conditions.

Foundries Also Down

Among Cleveland foundries, some are closed by labor troubles, while a few are just starting up again with the end of the steel strike. Of the foundries shut down by strikes, many are trying to get a commitment from OPA on prices, before granting wage increases. Some efforts to compromise wage demands of striking employees have met with little success.

Foundrymen point out that labor costs in the steel industry amount to between 20-21% of total costs, whereas labor costs in foundry operations come to between 50-60% of total costs. As a result, if they were forced to grant a wage increase similar to that in the steel industry, it would hit their over-all costs much harder. Meanwhile, they have to pay higher prices for pig iron and steel. As a result, many foundries are content to remain idle and see what is going to be done about price relief.

Steel fabricators are in the same boat, since they also face higher material cost coupled with demands for higher wages. Some small plants claim that unless they obtained enough price relief from OPA, the granting of wage increases would put them out of business in short order.

Steel Shortage Hurt

With respect to steel shortages, among the first to be hit was the Cleveland plant of Oliver Corp., builders of farm and industrial tractors. Instead of operating three shifts, the company is now operating one. Materials are coming in on a hand-to-mouth basis.

Lincoln Electric has been hit hard by the shortage of steel, being forced to shut down completely production in the welding electrode plant and operating the welding machine plant three days a week. Even this unit was threatened with complete shutdown due to lack of steel.

At one of Cleveland's largest plants, employing 5200 normally, 750 have been laid off with one assembly line shut down because of the shortage of steel and parts. Unless the present critical shortage is overcome by mid-March, the entire plant may close.

Experiences of steel consumers with the steel industry since its resumption are typified by the manufacturer who always used 24-in. sheets but was told by his mill that he would have to take 72-in. sheets and shear them himself. The manufacturer knew that unless he took them, he would not be able to get any steel for several months. However, he was unable to place orders for 1946 delivery at specific dates.

Fundamentally, all metalworking plants want to start operating full steam ahead. They are all besieged with orders and calls from customers. But, before full production can be achieved, they will await the adjustment of ceiling prices to levels compensating for higher wage and material costs.

BUFFALO PLANTS HIT

BUFFALO — Among plants in this area hit by material shortages and strikes are included: Buffalo Forge Co., General Drop Forge Division of Brown-Lipe Gear Co., the Buffalo Bolt Co., and the Houde Engineering Division of Houdaille-Hershey Corp., all hit by material shortages. Lack of orders from strikebound customers reduced the operation of Pratt & Letchworth Co. down to 50% of capacity. Meanwhile, the formerly strikebound Delco Division of General Motors at Rochester, N. Y., has resumed operations, while the 400 men laid off at New York Central's East Buffalo repair shops due to material shortages are returning to work.

Midwest Industry Disrupted by New Wage Price Formula, Steel Shortages

CHICAGO—Metalworking industries here have been generally disrupted by the government's so-called wage-price formula and its application to steel producers and users. American Can and Continental Can, which have 12 plants in this area employing 10,000 workers, have been faced with new wage demands, while they are trying to adjust operations to the new steel prices. International Harvester agreed to accept the recommendation of the federal fact-finding board on an 18¢-an-hour wage boost, if the pay increase was approved as a basis for seeking price increases.

Shutdowns Widespread

Meanwhile, other steel fabricating plants have been approached by the United Steel Workers (CIO) for pay increases. At the same time, other Chicago concerns have been forced to shut down due to lack of steel, despite the ending of the steel strike. Lyon Metal Products closed its plants in Chicago Heights and Aurora. Crown Stove Works, Cicero, was almost completely shut down. Cribben & Sexton Co., makers of gas ranges, closed down for four days, and then was able to resume limited operations. Other plants were preparing to close or go on a limited production basis.

Equipment Held Up

Rail equipment makers are waiting only for materials to become available to launch a tremendous freight car manufacturing program. In the next year, the carriers are expected to call for 10,000 freight car units, the heaviest program since 1941. Despite uncertainties about freight traffic with the war over, only a slight decline has been experienced thus far, and orders for 37,000 freight cars on hand Jan. 1, have been increased. One Chicago car builder said that there is no shortage of plant space to handle the huge railroad equipment buying program, but material would remain the key.

Pullman-Standard has started construction of 60 railroad cars ordered by Great Northern for five Empire Builder passenger trains, which will be powered by already delivered Diesel-electric locomotives.

IH Research Program

International Harvester has disclosed plans for a new research project aimed at improvement of manufacturing methods and procedures. Eight separate laboratories will be operated by men from Harvester plants. Subjects to be studied include welding, foundry, paint, packaging and product protection, machining, induction heating, heat treating, and metallurgical, chemical and physical testing divisions.

The latest government employment figures indicate how employment in manufacturing industries in Illinois had recovered in December, before its setback due to strikes and material shortages in January and February. December employment was up 2% over November and 4.6% over the October post-VJ-Day low. The metalworking industry had registered the greatest gain, with employment climbing from 516,000 in November to 524,000 in December. However, a later survey indicates rising unemployment due to labor strife.

MORE STANDARDIZATION OF BEARINGS SEEN

PHILADELPHIA—The possibility of greater standardization of sizes of ball and roller bearings was considered greatly enhanced here, after the recent backing of this move by S. F. Wollmar, executive vice-president, SKF Industries. Mr. Wollmar said that the industry might be able to reduce the number of sizes of anti-friction bearings required for industry from some 40,000 down to 2,000.

During the war, the Army and Navy had pushed for such standardization, against the protests of some manufacturers in the industry and some bearings users. However, standardization progress was made.

Price-Wage Squeeze Hits Small Steel Plants, Despite New Federal Rulings

PITTSBURGH—The latest price-wage squeeze on the steel industry is expected to intensify individual company efforts to maintain profits in coming months. This will result in more selective selling and production planning to give priority on mill schedules to those items carrying the best profit margin.

Although this is not a new practice, its increased intensification could virtually eliminate from production a number of poor or non-profit items. This would probably force consumers of such items to substitute another type of finished steel which can be secured more readily. An example might be the forced use of more cold-rolled sheets and strip, and a lessened consumption of hot rolled sheets and strip. Nails which take extras would be more easy to buy than common nails selling at a base price.

Small Plants Squeezed

Realizing the predicament of the 600 non-integrated plants, still shut down and keeping 300,000 workers idle, the OPA issued its new price scale with $2-$3-a-ton boost for raw and semi-finished steel, and a $4.50 to $7 boost on finished steel. Meanwhile, the President stated that his 18½¢ wage boost did not apply to the non-integrated plants.

Pittsburgh steel ingot production made a faster recovery after the strike than had been expected, but the pick-up in shipments lagged for a substantial period. Mill operating forces were striving to return plants to pre-strike levels. Repairs were less than had been anticipated, and delay due to rapid strike shutdown was encountered only at one major plant. Scheduling was revised to permit, as far as possible, the highest finished tonnage through extensive runs on one size and analysis.

Rigid Allocations

During the price uncertainty consumers were more interested in obtaining shipments on old orders than in placing new contracts. One important company said its allocation system would be rigidly in force and urged consumers to relax pressure on its sales officials. Auto makers were eager for resumed shipments, but certain processors showed no interest, being too busy with labor and price troubles.

Steel company stocks of coal were not bolstered much, even though captive mines continued working during the steel strike. The reason was that the greater part of output was cold to commercial users, and there was little stocking at the mines. Thus, the industry is not fortified against the possibility of a coal strike April 1.

NEW BUFFALO FIRMS

BUFFALO, N. Y.—Among the new companies which have recently been formed in this area are: Industrial Metallizing & Machine, 1940 Kenmore Ave., Tonawanda; Amherst Tool & Manufacturing Co., Evans Rd., Williamsville; Atlas Electro Plating Co., 1489 Niagara St.; Zimmer Die & Manufacturing Co., 281 W. Ferry St.; and the Alry Tool & Die Co., 171 Cherry St. in Buffalo.

Detroit Letter

"Paper" Market Fades

Labor troubles, material shortages and prospective price increases which loom importantly are combining to cut down in alarming fashion the "paper market" of 17,000,000 new cars in the next few years. It is also revising radically the thinking of high automotive officials on production schedules.

The 50 per cent increase in output to meet the demands of this prospective market is out of the window until or unless the present trend changes quickly. For this year at least, passenger car manufacturers will be satisfied with pre-war production. The total for the year may not exceed 2,500,000 cars. Right now, over 1,000,000 cars should have been produced. Actually output is about 200,000.

Higher Prices Seen

Even if the labor troubles quiet down and the flow of materials becomes steady and large, the upward swing in prices is feared, because apparently there is nothing to stop it. The only way that the industry can see to halt it is to bring out a cheaper car, one with less comforts than the buying public has become accustomed to having and then the question is, will people buy it?

Price increases already allowed are only a drop in the bucket compared with what is coming. Every company will be in at the OPA's throat as soon as the labor cost hike, allowed under new contracts, can be passed along the line. Suppliers and principals are determined to stop operating at a loss. It means that realistically, the $1,000 car will sell around $1,300 when all figures are in.

Plants Still Down

The end of the steel strike did not improve the situation immediately. The steel fabricating plants are still having their troubles with labor and until this is straightened out, full production in the automotive plants cannot be expected.

Ford plants started reopening on March 4th (River Rouge), the Mercury assembly line on the 11th, and the Lincoln assembly line the 18th. But Packard will not do much until April. Those still in production expect to hit a snag along the latter part of March because their suppliers must wait for steel plants to give them supplies. Bumpers and coil springs for seats are still a problem. So is tin.

However, it should not take auto plants long to swing into high and perhaps by the end of 1946 attain pre-war peaks. The rate may hit 500,000 monthly by mid-year without too great pressure. In 1929, the peak year for output, the manufacturers turned out 4,794,898 passenger cars, of this number 1,659,755 in March, April and May. There is little likelihood the industry will even reach half this amount in the same three months of this year but with the added capacity it already has, it could easily exceed the 1929 average in the latter half of the year.

New Models Deferred

The question of new models is being argued pro and con. Most manufacturers agree that once they swing into action on an all-out basis, it might be a good idea to forego the 1947 models and work right through on the 1946.

Several companies have some sort of idea what kind of a car they would like to change over to but the cost of the tools and dies will not be written off much before the end of the year and they may not want to shoulder the loss. This view may very well change if a competitor decides to break the line.

This tendency to sidestep 1947 models may bring the industry back to its old plan of getting out new models at the beginning of the year instead of at the end. It may also shift the automobile show from New York to Detroit.

Ford Settlement Highspots

With General Motors making little or no progress on settling its long strike with the UAW-CIO, the long-awaited Ford contract has finally been signed. The clause in which all other companies were interested was the retroactive part of the 18-cent an hour wage increase. It was found to date back to January 5.

The contract, to be in effect until May 30, 1947, assured the workers of an additional $2,000,000 in retroactive pay, extended overtime benefits and liberalized vacation pay rules. It returned the closed shop and dues checkoff to them.

But for the company it gave assurances of protection from wildcat strikes and sub-standard production. The company gave up its demand for financial responsibility for work stoppages in return for the union's pledge not to protect those guilty of instigating wildcat strikes. It will permit the company to impose such penalties as it sees fit on those who fail to cooperate. Layoffs up to two weeks will be given the first offenders. Extended layoffs or discharges will penalize those who participate in more than one.

A worker guilty of instigating stoppages is subject to discharge. No grievance procedure will be necessary.

The company estimated the wage increase will cost about $41,000,000 a year for its 103,000 employees. The average is now $1.40 an hour, making Ford workers the highest paid in the industry.

The 1946 Chrysler "Royal" Sedan—One of six models offered by Chrysler, this six-passenger, four-door sedan is powered by a six-cylinder engine with many new features. Engine improvements include rearrangement of wiring and accessories to facilitate repairs, a new intake manifold to provide greater operating flexibility at low speeds. The car is equipped with improved Hydraulic transmission, with the control unit built in, larger gears with a non-locking feature, while reduced transmission gear ratios provide improved acceleration

Disposition of Machine Tool Orders at Close of Lend-Lease Revealed by U. S.

WASHINGTON—A world-wide report on the status of $122,308,453 in lend-lease machine tool requisitions at the cut-off date, August 17, 1945, was given to AMERICAN MACHINIST last week by Senator Pat McCarran (Nevada) for whom it was compiled by the State Department.

STATUS OF LEND-LEASE TOOL REQUISITIONS
(As of August 17, 1945)

Status of Requisition	Approximate Dollar Value	Remarks
	CHINA	
(1)	$3,434,133	No contracts let; requisitions cancelled.
(2)	316,590	Deliveries going forward under terms of pipeline agreement; full payment on credit terms expected to be agreed upon.
(3)	30,000	Has become part of FEA stockpile in India. Possible transfer to China being negotiated.
	FRANCE	
(1)	$43,300,000	Requisitions have been cancelled.
(2)	26,400,000	Includes $10.5 million diversions from Russia later turned back to U.S.S.R. program. Remainder, including $3,800,000 diversions from Russian contracts, going forward under French Lend-Lease Agreement of Feb. 28, 1945, providing for 20% down, balance payable in 30 years.
(3)	33,000	Same as above.
	NETHERLANDS	
(1)	none	
(2)	$203,979	Includes $135,741 diversion from Russian contracts; going forward on 30-year credit in accordance with April 30, 1945 Lend-Lease Agreement.
(3)	693,021	$14,500 cancelled; balance on same terms as above.
	UNITED KINGDOM, BRITISH COLONIES, AUSTRALIA & CANADA	
(1), (2), (3)	none	
	SOUTH AFRICA	
(1)	none	
(2)	$4,400	Cash reimbursement
(3)	none	
	NEW ZEALAND	
(1)	none	
(2)	$54,960	Cash reimbursement.
(3)	none	
	INDIA	
(1)	$39,275	Requisitions cancelled, except for $3,963 which will be paid in cash.
(2)	95,008	Cash reimbursement.
(3)	1,674	Cash reimbursement.
	SAUDI ARABIA	
(1)	none	
(2)	$10,895	Straight lend-lease.
(3)	none	
	TURKEY	
(1), (2)	none	
(3)	$9,518	Cash reimbursement.
	U.S.S.R.	
(1)	none	
(2)	$19,500,000	Payment of fair value on credit terms arranged in October 15, 1945 agreement.
(3)	28,161,000	Exact terms of payment to be negotiated with overall lend-lease settlement.

In addition, $18,000,000 worth of machine tools under contract for U.S.S.R. were diverted to other areas or, when not taken up by them, were taken by U.S.S.R. under same terms as (3) above. Only $600,000 remain unallocated, some of which may be taken by U.S.S.R. The remainder will be declared surplus.

The report lists the requisitions in three categories:

1: Value of machine tools requisitioned but not contracted, $46,773-408.

2: Value of machine tools requisitioned and under contract, but not delivered, $46,601,832.

3: Value of machine tools in process of delivery in the U. S. or in transit to foreign destination, $28,-933,213.

Other Purchases Excluded

The first category is tools asked for under lend-lease by foreign countries, but which had not yet been ordered from American manufacturers by the U. S. government. Second and third categories are self-explanatory in the light of the first.

In submitting its report to Senator McCarran, the State Department explained that its figures refer only to machine tool transactions carried out through lend-lease—in other words, it has no reference to cash or credit purchases by foreign countries in the U. S. With one small exception in the case of India, amounting to only $4000, all requisitions under category 1, have been cancelled. State Department does not know whether the foreign governments concerned later obtained these tools through direct purchases from private vendors.

British Purchases For Cash

In the fall of 1943 the Foreign Economic Administration issued an order under which all requistions for any industrial equipment, including machine tools, for the British Empire, were put on a cash basis effective November 15, 1943.

Considerable difficulty and delay were experienced by the State Department in compiling the machine tool data, which was widely scattered with redistribution of functions, personnel and records of the Foreign Economic Administration. The report was submitted by Chester T. Lane, Deputy Foreign Liquidation Commissioner for the State Department.

GM Buys Buffalo Plant

BUFFALO—General Motors Corp. is preparing to buy the Buffalo plant of General Cable Co. to House GM's Harrison Radiator Division for the production of radiator parts. The $540,000 plant has a 310,000 sq. ft. floor area. General Cable is moving out its machinery, and is reported to be considering the transfer of its Buffalo wire operations to Rome, N. Y., or to New York City.

General Cable currently employs some 900 workers, and about as many are expected to be employed by Harrison Radiator. The move is part of GM's over-all expansion plan.

Washington Bulletin

Military Security Renewed

Military security, which was relaxed considerably following peace, is again being clamped on numerous defense research and production projects. Army and Navy recently declined to disclose even the money value of existing contracts for some of their major weapons and equipment developments. These are in the fields of guided missiles, fire control, radar, metallurgy, submarines, high-speed aircraft, and other devices of war. International unrest is the reason for precautions. Further restrictions may be expected. Strangely enough, while holding the lid on some military activities, Army and Navy at the same time are preparing to reveal the result of tests next summer which will determine the effectiveness of atomic bombs on surface and submarine ships. At the same time, the United States and Canada are inviting newshawks to accompany cold-weather aircraft carrier tests off Greenland—a highly-significant maneuver, international relations being what they are at this time. These contradictions in security policy either do not make sense, or they need a lot of explaining.

Veteran Information

The War Department is calling attention of employers to its Form 100—Separation Qualification Record, which shows the GI's military experience that might be useful in his civilian job. The form is a thorough and well-organized experience record, but several ex-soldiers have told the writer that employers should check each one carefully. They say that many interviewers, who make up the forms for out-going GI's, simply ask questions without referring to service records. Some of the men, anxious to make impressive showings, exaggerate their experiences. Their employment on that basis alone would be unfair to themselves and to employers alike.

Military Studies Industry

Ninety selected officers of Army and Navy have been sent to the Army Industrial College to begin a new study of the relationship between materials and production and war. The College will try to analyze the record of the war and determine where mistakes were made; it will try to determine the availability of raw materials, domestic and foreign; try to draw a plan for future rapid transition from civilian to war production in case of need. Undoubtedly one of the College's first observations will be that it's "push button" mobilization plan for this war, a plan under which 10,000 plants were to go into war production upon receipt of a telegram from Washington, was a complete failure. The College realizes that it is up against extreme difficulty in trying to blueprint for modern war, in which invention and strategy move change from day to day.

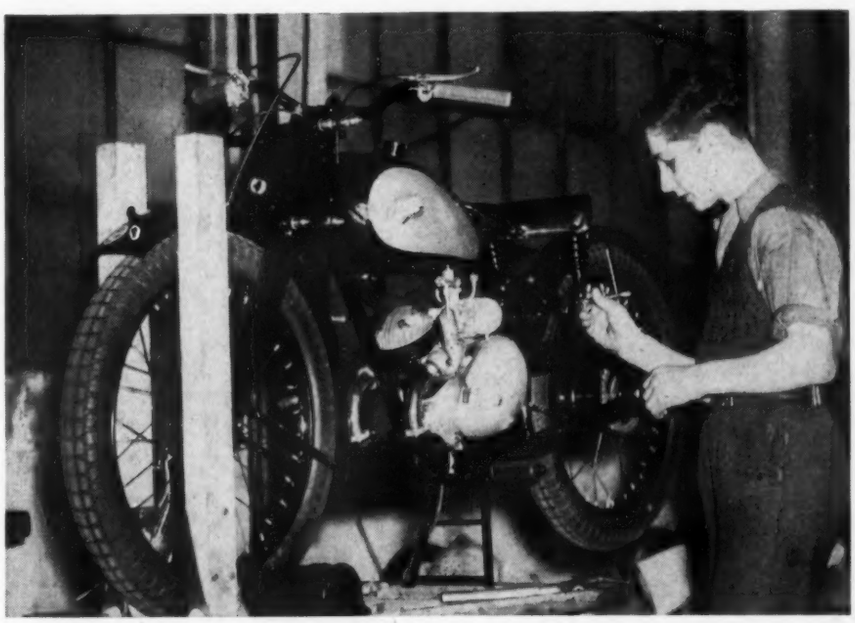
Shipping Outlook Obscure

Imminent at this writing is passage of a bill in Congress providing for disposal of surplus war shipping. Maintenance of price is provided for the protection of early investors against those who would otherwise wait in hope of bargains and resulting competitive operating advantages. The moderate speed "C" types, and slow "Victory" types, are suitable for most cargo trade and little construction will be needed for years to come. For fast passenger traffic, the Maritime Commission has called for bids on five luxury ships, two of 28 knots and three of 22 knots. Eleven major steamship lines reveal plans to procure 89 custom-built liners, but this is tentative, depending on government merchant marine subsidy policy, on the decision of Congress for or against aviation auxiliary for ship lines, and upon United Nations policy. Shipping men are gravely concerned lest airlines take nearly all passenger trade in the next few years. At very best, ship construction will be comparable with the industry of ten years ago. Even though the U. S. does not sell surplus ships to foreign countries, all can build their own at lower material and labor costs.

NEW ORDNANCE CHIEF

Maj. Gen. Henry B. Sayler

Maj. Gen. Sayler is acting Chief of U. S. Army Ordnance, succeeding Gen. L. H. Campbell retired.



British Motor-cycle Boom—The British motor-cycle industry has unprecedented demands for its products from overseas, and is ready to produce 1,500,000 this year for export, as against 1,000,000 for the home trade. Orders from 50 countries include a record U.S. order to 5,000 motor-cyclettes, of the type shown here, produced by the James Cycle Co. The saddle is here being fitted to a 125c.c. James light-weight machine

Unions-Industry Unenthusiastic on New Wage-Price Policy; Tie-Ups Continue

NEW YORK—Metalworking executives, relieved in mid-February when the steel strike was settled, were wondering in mid-March if their hopes for a lasting labor peace were premature. From coast-to-coast there was growing belief that President Truman's Valentine Day wage-price policy might lead to new confusion and unrest, not to its objective of full speed ahead for reconversion.

The new formula, announced belatedly after serious internal ructions in White House advisory circles, bid for labor support by liberalizing the standards for granting wage and salary increases. It also bid for management support by liberalizing slightly the standards for offsetting price increases. But by mid-March, the wage-price formula had found very few advocates either in labor's ranks or management.

The Formula's Theory

The formula was designed to permit wage increases consistent with the "general pattern" of upward wage adjustments since VJ-Day, roughly, between 15% and 20%—the difference between the 15% wartime wage advance under the "Little Steel" formula and the 33% rise in living costs between January, 1941, and September, 1945. Increases are to be figured on the basis of "wage or salary rates," which means basic rates and not—as in prior government wage directives—average straight-time hourly earnings in which are included basic rates and various premiums and "fringe" payments. While average hourly earnings went up about 38% between January, 1941, and September, 1945, basic wage rates climbed only about 16% or 17% in that time. Boosting basic rates another 15-20% gives labor just what it has been asking: maintained take-home pay without longer or harder work. For management, it means the same total labor cost as in the past, but fewer hours and less productivity per worker for such wages.

To make up partly for that, the new formula provides that any approved wage increase may be used in asking immediate upward revision of price ceilings, if an employer can show that without such an increase he cannot realize an average prewar (1936-39) rate of profit on the net worth of his business. In the past, a proving period of six months was required before an employer could petition OPA to lift the ceiling on products being turned out at a loss; now there is not supposed to be any proving—or waiting period.

Labor, Management Dubious

Stating the formula that way oversimplifies it, since the plan, at best, is sketchy, with much left to interpretations and rule-of-thumb judgments by its administrators. As it is, past experiences with National War Labor Board and other administrative agencies have made both labor and management wary of the way the simplest regulations are often open to several opposed and confusing interpretations.

Labor is critical because it sees another ceiling—33% this time—placed on wages, and with management free to raise prices there is certain to be a rise on living costs which will offset any raise won. Management is critical because it sees no solution to present problems in the wage-price formula, but rather a threat of a series of new and pressing wage demands—backed by strikes, new confused dealings with Washington, and new uncertainty on future planning.

Steel Tie-ups Continue

The formula was advanced with great hope of settling nationwide strikes which in mid-February were idling 1,500,000 workers. The first response was favorable. The steel strike end was announced, on the basis of an 18½c-an-hour pay rise for workers and a $5-a-ton increase in the price of steel for employers. Within less than a week 500,000 steelworkers were back in the mills, production was climbing back toward capacity after reaching a record low.

But glowing optimism was tempered when the tieup of steel fabrication plants continued, with 250,000 workers idle. The fabricators were pressed to pay 18½c hourly increases to workers, and were faced with the prospect of higher prices for their steel. However, OPA price increases took cognizance of this. Boosts of $2-$3 a ton were allowed on raw and semi-finished steel, and $1.50-$7 on finished, thus alowing fabricators a wage-profit margin.

Other Serious Strikes

Similarly, General Electric and Westinghouse officials wanted assurances that they would be given adequate pricing aid if they followed General Motors' electrical division with 18c hourly raises for their 175,000 striking C.I.O. electrical workers. But, according to OPA, prior consultation on price relief was impossible; wage raises must come first.

And, of great concern in the metal trades, the same situation held in the brass, copper, and lead smelting, refining, and mining industries in which comparatively small strikes cut production down 35% to 50% and threatened the reconversion operations of many large plants.

These strikes, and smaller ones, persisted in the face of the formula created to end them, largely because no-one had ready answers for the important — and complex — pricing questions.

Meanwhile, one strike continued into March in which neither pricing or wages was the major factor. That was the General Motors strike, which went into its 14th week only because the C.I.O. union and G.M. still were unable to get together on continuation of such NWLB war-torn directives as maintenance-of-membership. Only 1c an hour separated G.M.'s wage offer (18½c) and the union's demand (19½c). Definite progress had been made in negotiations.

Child Labor on The Picket Line—Union delegates line up children of striking workers for a brief picket demonstration at the Essington, Pa., plant of Westinghouse Electric Corp. This new wrinkle is one of many recently designed to win public sympathy for strikers

Machine Tool Business Holds As Industry Pushes Expansion

NEW YORK—Machine tool inquiries and orders continue to hold at a steady level despite the unsettlement of the metalworking industries by strikes, resulting material shortages, and price and wage uncertainties. It is pointed out by dealers that many plants planning to expand have been making purchases steadily and over an extended period of time, since they appreciate the fact that deliveries are extended anyway. Some of them have been badgered by labor and pricing troubles and have held off making purchases, but the overall volume of potential business seems to be extensive, judging from the new orders and inquiries of recent months.

CINCINNATI PLANER CO. SOLD; LANGEN PRESIDENT

CINCINNATI — The Cincinnati Planer Co. was acquired for about $3,500,000 by a local group headed by Sidney G. Rose, Philip L. Moskowitz and Ben Moskowitz. The company will continue under the management of George Langen, former vice president, who will become president, while Mr. Rose becomes chairman of the board. Other officers will include: Philip Moskowitz, vice president; Verner Schoolfield, vice president and treasurer; John H. Daum, vice president in charge of sales, and Ray J. Steiner, secretary. Except for Moskowitz and Rose, all of these officers had been connected with the former company.

George Langen

Mr. Langen had been factory manager of the company since its inception in 1898, when it was founded by Bert B. Quillen, president and principal stockholder, who died a year ago. The remainder of the company's personnel is also being retained.

Mr. Rose is also president and general manager of Cleveland Wrecking Co., Rose Brothers Co., Associated Building Wreckers & Materials Co., and managing head of the Empire Case Good Co., Frederick Iron & Steel Co,. and Hoosier Cabinet Co.

A warehouse in this area, jammed with surplus tools, has been shut down for two weeks while veterans are given their opportunity to make priority purchases of such items. At the end of the two week period, the surpluses will be thrown open to all buyers regardless of priority status. This practice is being carried out in some surplus district office, while others are reported to be maintaining "waiting lists" of priority purchasers on the more popular items, and shunting aside non-priority buyers on all items.

Financial Aid to Small Plants Proposed to Help Reconversion

WASHINGTON — Financial aid for the small business man in starting or maintaining his enterprise is being advocated in legislation proposed by the Small Business Advisory Committee of the Department of Commerce. Under the plan, the borrower would put up at least 25% of his own capital, and obtain a long-term loan from his banker. Up to 90% of the loan would be guaranteed by an authorized federal agency, thus insuring against excessive loss.

Provision is made for the repayment of the principal and loan out of operating profits, making it possible for the borrower to retire his loan at an accelerated rate when business prospered, but in smaller amounts during less favorable times.

During February, loans by the Reconstruction Finance Corp. to small business since Feb., 1942, passed $450,000,000. Currently, small business loans are being authorized to speed up reconversion and to finance postwar business expansion.

New Construction and Expansion

F. L. Jacobs Co., Detroit, has broken ground for a major appliance plant in Indianapolis, Ind.

Electric Auto-Lite will shortly begin production at the Kings Mill plant, recently acquired from the government. New machinery is being installed in the plant, which will employ 800 workers when going at full capacity.

Food Machinery Corp., San Jose, Calif., is building a large factory, to be completed by the end of the year, and a $350,000 office building to house its central research and engineering department.

Doehler-Jarvis of Toledo has increased its expansion plans to cover two new casting plants, a compressor room, a warehouse and two new wings, costing more than $1,000,000.

Ford Motor Co. has started to erect a combination assembly plant with a wing to house sales showrooms and offices in Atlanta, Ga., as part of its $200,000,000 expansion program.

The Fadweld Corp. has begun construction of a $20,000 steel manufacturing plant at Nowata, Okla.

The **Kellogg Div., American Brake Shoe Co.** is expanding its Rochester, N. Y. plant, enabling it to double its production. The work is expected to be completed about April 1.

Ingersoll Steel Div., Borg-Warner has launched a large expansion program in its various plants. At West Pullman, a new disc plant and a new rolling mill are under construction, while the Kalamazoo, Mich. plant is installing modern farm machinery production equipment. Also, the production capacities at both the Newcastle, Ind. and Calumet, Ill. plants are being increased.

Pan American Alloys, Inc., New Orleans, La. has purchased the buildings formerly operated by the **National Machine & Foundry Co.,** Scottdale, Pa., thus considerably enlarging its production facilities.

Niagara Machine & Tool Works, Buffalo, is planning a building extension to handle welded structures. The addition should increase employment 25%.

Mey Chain Belt Co. has purchased a building at 14-18 Sycamore St., Buffalo, N. Y., for the manufacture of chain belts.

Brown Instrument Co., Philadelphia, will spend about $250,000 in the coming year for new manufacturing, processing and development equipment, thereby doubling its 1945 expenditure for machine tools.

The **Schaible Co.,** Cincinnati will spend $170,000 for expansion; $42,000 for a new building, and $128,000 for new production equipment.

Spotting the Air News

Postwar Plane Production

Just over 50 surplus aircraft plants have been sold to date, and only five have gone to the aircraft industry for production of planes, engines, parts. Four of the plants were acquired by their war-time operators. Of the 16 aviation plants leased, five have been taken by aviation manufacturers, all five by their war-time operators.

Alfred Marchev, president of Republic Aviation, recently stated that the cost of producing airplanes can be reduced to about 20% of the prewar figure through simplicity of design. He recommended following the experience of automobile builders. Twenty years ago, he said, a generator cost $120; today the price, even with high labor rates, is $12. Citing Republic's own Seabee plane, he said parts of the stabilizer had been reduced from 114 to 21, weight from 150 to 110 lbs., rivets from 2627 to 882.

New Plane Types

Harry Thalman of Salt Lake City has produced a remarkably light single-seat airplane, 850 pounds, by using a spruce basket weave construction, previously developed by the British in their Wellington bomber. Most engineers agree that wooden airplanes are out, but interesting developments continue.

First commercial deliveries of helicopters will be made this summer by Sikorsky, leading pioneer of development in the rotary wing field. The S-51, based on 36,000 hours of military experience, will seat 4, do a top speed of 104 m.p.h., cruise at 80 m.p.h., and cover a range of about 240 miles, with a 450 h.p. Pratt & Whitney engine driving a 3-bladed 48-foot main rotor. The price is about $50,000.

A contract has been let for concrete docks at Los Angeles from which to flight test the huge 8-engined wooden flying boat under construction by Howard Hughes at Culver City. A Congressional inquiry into to the reasons why this boat was ordered by the Army over its own protest and under pressure of the Roosevelt Administration, is almost certain. Congress will ask also why it was built inland to be shipped to water at great expense. Very few engineers hope for any important data from building and testing of the ship; practically none hope it will be put into service.

Improving Air Liners

Those big contracts for airline planes have escape clauses in them and it is hard to determine just yet which companies will lead the field. Actual design is improving rapidly, and air-brush pictures of proposed models still more rapidly. It is known that operators who committed themselves in the rush to get priority on postwar deliveries are now disturbed by publicity, speed records and advertisements of later designs. Douglas, Glenn Martin, and Lockheed are main contenders right now. The airlines would like nothing better than to resume their peaceful prewar standard equipment policy, which worked beautifully on the DC-3, with the advantages of reduced cost, lower maintenance, uniform training, etc. But the public is showing high sensitivity to claims of speed, safety, luxury, and will have to pay for it in high costs for engineering and short-run production.

New Kaiser Venture Takes to the Air—A twin-tailed, pusher type airplane (the Kaiser-Hammond) to be manufactured by industrialist Henry Kaiser, is shown here warming up for its test flight at Oakland, Calif., last month

Canada Sets Up Emergency Unit Over Arsenals and War Research

OTTAWA—The Canadian government has arranged plans for industrial preparedness against any future emergency, via the newly-formed government company, Canadian Arsenals, Ltd. Canadian Arsenals will operate seven plants to keep up the Dominion's production know-how in munitions, and maintain adequate reserve equipment.

The Longeuil, Que., plant operated by Dominion Engineering during the war, will be converted to a gun plant. Guns returned from overseas will be overhauled and repaired, and the plant will store all gun parts and tools in the hands of manufacturers at the end of the war. New designs will be developed, and from time to time manufacturers will be asked to study them and work out manufacturing techniques.

Arms, Equipment Stored

The repository for rifle manufacturing tools and equipment will be a small arms plant at Long Branch, Ont., which will be equipped for rapid shift into full production. Machine tools for small arms ammunition manufacture will be stored at the government arsenal at Quebec, which will carry on small but continuous production of small arms ammunition. The government arsenal at Lindsay, Ont., will be the base for heavy ammunition equipment storage and experimental manufacture.

The three other plants include one at Quebec for high explosives and chemicals; ammunition loading at St. Paul L'Ermite, Que.; and instruments at Leaside, Ont. All of these plants are considered essentially war plants.

Canadian Arsenal, Ltd., has also been given the job of maintaining constant liaison with various industries, which can be readily converted to war production. This liaison will keep industry informed of developments in equipment it might produce, and at the same time keep the government informed on shifts in the equipment and productive capacities of these plants.

Russian Orders Halted

Negotiations between the Russian government and the Canadian government on undelivered machine tools, originally scheduled for shipment to the Soviet under mutual-aid, have been broken off, and manufacturers have been ordered to stop further work on the contracts. Moreover, the tools originally produced for Russia are being made available for sale to other buyers. Until recently, production of such equipment was continued while Russia attempted to secure lower prices and long range credit terms on undelivered machine tools and other industrial machinery.

Names in the News

Mason Britton

Mason Britton has been elected president of the Metal Cutting Tool Institute. Mr. Britton has recently been director of the Tools Div. of OPA and administrator of the Surplus War Property Administration and Surplus Property Board.

Dr. L. A. Phillip, former chief engineer of the Kelvinator Div., Nash-Kelvinator Corp., Detroit, has been elected vice president of the corporation in charge of engineering.

John M Demarest has been appointed vice president and works manager of the Marion Steam Shovel Co., Marion Ohio. He was formerly controller and manager of the Paterson, N. J. plants of the Wright Aeronautical Corp. and with the WPB.

Robert W. Wolcott, president of Lukens Steel Co. Coatesville, Pa., has also been elected president and chairman of the company's two subsidiaries, By-Products Steel Corp. and Lukenweld, Inc. **R. W. Moffett,** who resigned as president of By-Products Steel Corp., has become general manager of fabrication for Lukens Steel Co. and its subsidiaries, while **C. L. Huston, Jr.** has resigned as president of Lukenweld, Inc. to become executive assistant to the president of Lukens Steel Co.

Roger W. Batchelder has been appointed general purchasing agent of American Brake Shoe Co., New York City, to replace **William T. Kelly, Jr.,** who is now president of the company's Kellogg division.

Glenn McDowell, former assistant to the vice president, has been appointed manager of roll sales for The Aetna-Standard Engineering Co., Youngstown, Ohio, and **William D. Todd,** former director of the WPB's steel division, has been named assistant to the president.

Charles R. Newpher, until recently sales engineer in The Reliance Electric & Engineering Company's Cleveland district office, has been appointed production manager and **Frank A. Yusek,** assistant superintendent, has been made factory superintendent of the Ivanhoe Division.

Wilmot F. Wheeler has been elected president of American Chain & Cable Co., Inc., Bridgeport, Conn., to succeed the late **William T. Morris.** At the same time, **Cyrus N. Johns** was elected executive vice president. Mr. Wheeler has served as director, treasurer and executive vice president during the past 25 years. Mr. Johns, who was formerly with the Page Steel and Wire Co. before it was made a division of American Chain & Cable, is a director of the firm and in 1940 was elected vice president in charge of operations of all plants.

Wilmot F. Wheeler

Cyrus N. Johns

Paul K. Povlsen has been named vice president and general manager of Maguire Industries, Inc. and will supervise all manufacturing operations of the company and its subsidiaries.

Robert A. Parks has been named general sales manager of the Jessop Steel Co., Washington, Pa. He was formerly district manager in Washington, D. C.

A. F. Leis, former chief engineer for Acme Aluminum Alloys, Inc., has been named general manager of the Oakwood Tool & Engineering Co., Dayton, Ohio.

Howard N. Girardin, sales manager of the Empire Tool Co., Detroit, has also been appointed assistant to the president. **Harlow E. Ohr** has been made director of production control and purchases.

W. B. Lockwood was recently elected president of the Cold Metal Products Co., Youngstown, Ohio, while **C. M. Beeghly** was elected vice president.

R. W. Boettiger

David A. Coulter

Russell W. Boettiger, former chief planning engineer, has been appointed sales manager of Leslie Co., Lyndhurst, N. J. He joined the Leslie organization ten years ago as a sales and service engineer.

David A. Coulter has rejoined Basic Manufacturers' Sales Corp., New York City, as vice president and director. He was formerly with the New Britain Machine Co., New Britain, Conn., for six years where he was in charge of sales, public relations and advertising for the tools division.

Ted Nagle has been appointed director of sales of Hydraulic Machinery, Inc. Dearborn, Mich., and its associated companies.

Allen D. Pettee has been appointed chief electrical engineer of General Cable Corp., New York City.

C. A. Howe has been appointed director of sales by Barnes & Reinecke, Chicago. Also, **Harry Ankeney,** for ten years a sales engineer with Cutler-Hammer, Milwaukee, Wis., has joined the sales engineering staff.

Nelson M. Hopkins, who recently resigned as purchasing agent for machinery at the Curtiss-Wright plant, Buffalo, N. Y., has become assistant sales manager for Kane & Roach Co., Syracuse, N. Y.

Earl H. Lenz, who has resigned as production manager of the Buffalo, N. Y. Curtiss-Wright plant, has been appointed production engineer of the Twin Coach Company's new Buffalo division.

Grover C. Schantz has been appointed production superintendent of the Optimus Equipment Co., Matawan, N. J.

Emery B. Gebert has joined the Hungerford Research Corp., Murray Hill, N. J. as chief powder metallurgist.

John S. Reed has been named manager for the Manning, Maxwell & Moore manufacturing plant at Tulsa, Okla., to replace **W. A. Sawyer,** resigned.

BUSINESS ITEMS

Cosa Corp., New York City, has opened showrooms for a permanent exhibit of much of its equipment at 4572 Broadway.

Todd Pacific Shipyards, Inc. has purchased the **Los Angeles Shipbuilding & Dry Dock Corp.**, Los Angeles.

The **Heppenstall Co.**, Pittsburgh, has appointed **S. J. Mergenhagen** as its district representative in Philadelphia with offices in Room 1052, Drexel Bldg.

Impression Molding, Inc., North Wilbraham, Mass., has been formed to produce proprietary molded and laminated products employing low pressure techniques. The company is headed by **Michael A. Brown, Jr.**, formerly with Monsanto Chemical Co., and **W. S. Larson** will serve as consultant and technical advisor.

York Corp. has formed an international division with headquarters at 50 Broadway, New York City. **James C. Tweedell** has been named manager.

Lovejoy Tool Co., Inc., Springfield, Vt., has named **Lempco International, Inc. as** its representative in foreign markets, selling its metal cutting tools.

The **Management and Research Group, Inc.**, an industrial and engineering firm, has recently been formed at 1118-1124 West Pearl St., Cincinnati. **Thomas Warner,** president of Warner Industries, will be president of the research unit, while **Scott Emerson, Sheldon H. Waldron,** and **L. A. Bierly** will be vice presidents.

The Modern Design & Tool Co., 704 Guadalupe St., Austin, Texas, has been organized by **L. D. Kubecka** and **B. E. Duvall** as a design and consulting service.

Buffalo International Corp. 50 Church St., New York City, has recently been formed as a foreign trade subsidiary of the **Buffalo Bolt Co.**, North Tonawanda, N. Y. **Joseph C. Walker,** Buffalo Bolt's New York district manager, has been named president of the new concern which will also distribute products of Buffalo Bolt's two subsidiaries, **S. M. Jones Co.**, Toledo, Ohio and the **Eclipse Lawn Mower Co.**, Prophetstown, Ill., in 19 countries.

Alloy Casting Co., Champaign, Ill., has appointed **Thomas J. Donovan, Jr.** of the **Donovan Co.**, 1615 North Second St., Philadelphia, as its engineering representative in N. J., Philadelphia, Baltimore, and eastern Pa.

International Nickel Co., Inc., has opened a St. Louis technical section of its Development and Research Div. in Room 810, Ambassador Bldg., 411 North Seventh St.

Richard Brothers Div., Allied Products Corp., Detroit, has appointed **The Geo. A. Rieke Co.**, 549 W. Washington St., Chicago, as its sales representative in its territory.

ASSOCIATION NEWS

George W. Mason, president of Nash-Kelvinator Corp., has been elected president of the **Automobile Manufacturers Association** to succeed **Alvan Macauley,** chairman of Packard Motor Car Co. and head of the association for 18 years. **George Christopher,** president of Packard, was elected treasurer to succeed Mr. Mason.

William W. Coutts has assumed the post of executive vice president of the **Gray Iron Founders' Society, Inc.**, succeeding **W. W. Rose** who has retired. Mr. Coutts until recently was assistant secretary of the National Screw Machine Products Association.

The **American Standards Association** has formed an executive committee, headed by **Howard Coonley,** to direct the financial, administrative, and executive phases of the association. Other members of the committee include: **Henry B. Bryans,** president, Philadelphia Electric Co.; **Frederick R. Lack,** president, Western Electric Co.; **Clarence L. Collens,** chairman of the board, Reliance Electric & Engineering Co.; and **George H. Taber, Jr.,** president, Sinclair Refining Co.

The **Resistance Welder Manufacturers' Association,** at a recent meeting, elected the following officers for 1946: president, **H. B. Warren,** executive vice president, Thomson-Gibb Electric Welding Co.; vice president, **G. N. Sieger,** president and general manager, S-M-S Corp.; executive secretary, **George A. Fernley;** and secretary-treasurer, **H. R. Rinehart.**

R. M. Hindman, of the Doehler-Jarvis Co., is the 1946 chairman of the Toledo chapter, **American Society of Tool Engineers.** Other officers chosen were: **Albert Hage,** Hage Industrial System, first vice chairman; **Valentine G. Kessler,** Spicer Mfg. Co., second vice chairman; **Lawrence Rothert,** Kent-Owens Machine Co., secretary; and **Russell H. Brown,** American Floor Surfacing Machine Co., treasurer.

Rudolph Harrold of the Cleveland Duplex Machinery Co., was named chairman of the **American Society of Tool Engineers,** Cleveland chapter, for the coming year. Other officers include: first vice chairman, **E. W. Baumgardner,** National Carbon Co.; second vice chairman, **Harry Osborn,** Ohio Crankshaft Co.; secretary, **Harry E. Peiffer,** Clevland Duplex Machinery Co.; and treasurer, **J. H. Schron,** The Glenn Tool Co.

OBITUARIES

Luther A. Sommer, 67, president of Sommer & Adams Co., Cleveland, died March 2. Mr. Sommer, who organized the firm in 1919, was a past president of the National Tool & Die Manufacturers Association and the American Society of Tool Engineers.

Col. E. J. W. Ragsdale, 61, inventor and research engineer for the E. G. Budd Manufacturnig Co., died Feb. 24. Col. Ragsdale promoted the manufacture of four-wheel brakes for automobiles, invented the shot-weld system for fabricating stainless steel, and helped develop some of the features now used in stainless steel railroad passenger cars.

Robert L. Gordon, 71, vice president and director of the Pullman-Standard Car Manufacturing Co. and its affiliated export corporation, passed away Feb. 12.

Sidney C. Vessy, 80, president of the W. W. Sly Manufacturing Co., Cleveland, for over 25 years, died Feb. 14.

Earl W. Carran, 58, president of the E. W. Carran & Sons Co., Covington, Ky., died suddenly on Feb. 8.

Samuel R. Parry, 83, founder of the Samuel R. Parry Machine Co., Inc., Rochester, N. Y., which he established in 1899, died Feb. 13 after a long illness.

Byron G. Harrington, who formerly operated the B.G.H. Metal Manufacturing Co., Syracuse, N. Y., died recently at his home in Fla.

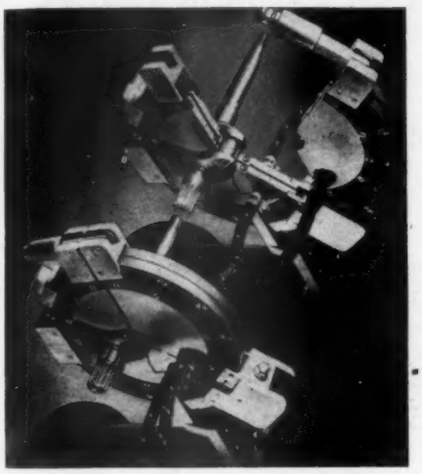
MEETINGS

American Society of Tool Engineers. New Era Exposition. Cleveland Public Auditorium, Cleveland, Ohio. April 8-12. C. V. Briner, president, 1666 Penobscot Bldg., Detroit, Mich.

Society of the Plastics Industry. National Plastics Exposition. Grand Central Palace, New York, N. Y. April 22-27. W. T. Cruse, executive vice president, 295 Madison Ave., New York 17, N. Y.

Shop Equipment News

Split Induction Heating Coil Hardens Shafts, Throws and Crankshafts



Power concentrations as high as 20 kw. per sq. in. on 1/2-in. dia. shafts are possible by use of the multi-turn split coil, resulting in hardened cases of 0.020-in. thicknesses when used with equipment having an output frequency of 375,000 cycles

Induction hardening of localized surfaces of such parts as crankshafts, camshafts, and similar components can be done by the multi-turn split coil developed by the Induction Heating Corp., 389 Lafayette St., New York 3, N. Y. Where the design of the part to be hardened prevents it being placed within the conventional type of induction heating coil a split-type coil must be used. Where diameters are relatively small, (1 in. or less) it is necessary to use coils or more than one turn to provide sufficient energy transfer.

The Thermonic multi-turn split coil consists of two or more turns, made of machined copper plates, which are split and hinged to allow the coil to be opened, the work inserted in place, and the coil closed and clamped; automatically making contact between the segmental sections to provide a continuous path for current flow. Coil segments are held by an insulating retainer ring around the outside of the coil proper and forms a closed passage between coil turns. When hardening operations are to be performed, this chamber can be utilized to carry the quenching medium to the heated metal without removing the work from the coil. This eliminates time delay between the end of the heating process and the start of the quench. Full advantage of the surface effect of high-frequency induction heating can be obtained, since excessive thermal conduction into the heated part is prevented. As both the coil segments and supporting leads are independently water-cooled, the coil may be used without internal quenching, thus permitting continuous operation.

Small-diameter crankshafts can be hardened to a depth of 0.020 to 0.030 in. Brazing operations on assemblies such as hubs to shafts, where the hubs are of greater diameter than the shafts, are possible.

Unsprung Weight Ratio Lowered With Cast Aluminum Wheels

Cast-aluminum industrial wheels, manufactured by Aircraft Mechanics, Inc., Colorado Springs, Colo., are mounted to solid-rubber or zero-pressure rubber tires. The two wheel halves are designed to fit into the tire and seat as the wheel bolts are tightened. Wheels in sizes from 2 to 10 in. for various tires, and with load capacities ranging from 300 to 884 lb. are available. Standard models have dust-proof bearings.

Jack & Heintz Inverter Provides High Cycle Current

Jack & Heintz, Inc., Cleveland 1, Ohio, introduces the first of a series of dc.-ac. inverters. The 2500-va. inverter provides a source of 400-cycle, 115-volt power. This unit is of the motor-generator, two-bearing type, complete with control box. The motor is a 4-pole, shunt machine, with a series field, for quick starting at low current, and has two interpole windings which give sparkless commutation throughout the range of loads. The brushes have a minmum life of 750 hr. The 6-pole alternator field is equipped with amortisseur windings.

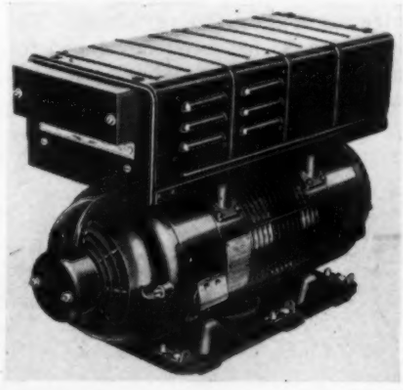
Aluminum and magnesium parts are protected against corrosion by phosphatizing or dischromating before painting. The windings are double vacuum impregnated, then baked, and are mechanically secured.

Mixed-flow fans are mounted on each end of the rotor shaft and the airflow from each fan cools the dc. and ac. sections of the machine separately, with a partial diversion of air to cool the control box. The armature unit is mounted on high speed, grease packed ball bearings and is dynamically balanced.

The stable speed characteristic of the motor is closely controlled by a carbon-pile speed governor, mounted on the motor end of the machine and accessible for adjustment.

A ribbed aluminum control box is mounted on the top of the machine by brackets which also house and shield the conductors from the machine. Relays are provided for starting and running, the starting operation is entirely automatic and the series field is shunted out when the operational speed is attained. A carbon-pile voltage regulator on a detachable shock mounting is located in the control box, providing close control of the output voltage over the load range.

Filters are installed in the control box to minimize ac. ripple at the input terminals.

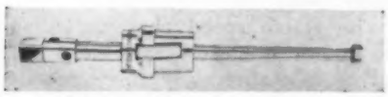


Armature unit of the Jack & Heintz inverter is dynamically balanced and mounted in ball bearings

Dudgeon Tube Expander Rolls Closely Grouped Tubes

The Model 16 tube expander manufactured by Richard Dudgeon, Inc., 24 Columbia St., New York 2, N. Y., has been designed with a minimum of parts—frame, rolls and mandrel. The expander may be dismantled and new rolls quickly inserted. The frame holding the rolls is heat treated steel, hardened and tempered. Mandrel and rolls are hardened tool steel. Rolls are extra long and reversible. They are set at an angle with the mandrel for self-feed. Reversing the mandrel releases the expander from the tube.

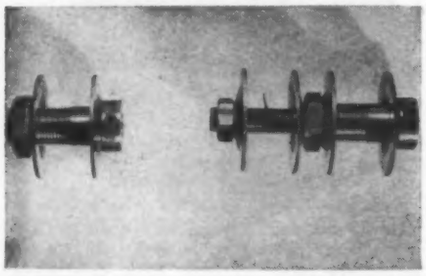
Model 16 expanders are compact, permitting them to work close to the boiler shell, rivet lines or tubes grouped together. They bear on the end of the tubes; do not draw tubes out of the tube sheet and roll the tube ends for their full length. They are furnished for hand or combination hand and power use.



New rolls can be inserted in the expander by dismantling the mandrel

Super Arbors Expand Range Of Grinding Wheel Motors

The No. 150 Super Arbor, manufactured by A. D. McBurney, 939 W. 6 St., Los Angeles 14, Calif., is a combination attachment arbor for ½-in. electric motor shafts designed to take grinding wheels with ¾-in. holes on main shaft, or ½-in. holes on the small ends. The extension can be used for rag or wire wheels, or for circular saw blades. It also holds ½-in., 24-thread drill chucks. The arbor fits well over and onto main motor shaft, eliminating whipping and disintegration of grinding wheels. The Super No. 95 has been developed for mounting grinding wheels directly over motor shafts.



The Super Arbors can extend and enlarge shaft for oversize wheel holes

Fixture setups can be fastened to tops of the Work—Flow table and interchanged for several operations. The top is adjustable for height and angle, up to 20°, with a crank

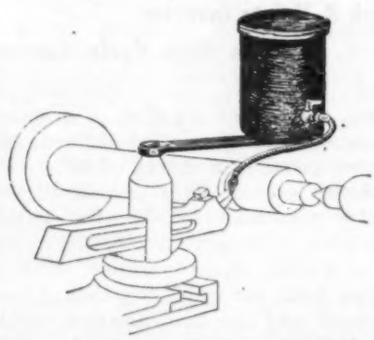
Adjustable Working Surface Provided by Work-Flow Table

Two adjustable work tables, a tilt-top work table and a drafting table, have been developed by Work-Flow Equipment Co., 207 Penn Ave., Pittsburgh 21, Pa. The height of the work table may be adjusted from 28¼ to 38¼ in. from a level position to any angle up to 20° for comfort of the operator in a sitting or standing position. Adjustment is controlled by a small crank at the front of table. Top is removable. Drafting table can be adjusted in height and angle. Storage space is provided for three extra boards so several working layouts may be kept intact at once and can be interchanged. Drafting table is also equipped with large drawers for working materials. Both tables are finished in dull green.

Coolant Cup, Readily Removable, Supplies Cutting Fluid for Lathes

The Tru-Punch Company, Box 14, Kingsbridge Station, New York 63, N. Y., announces a reservoir for coolant or cutting oil that can be quickly attached to any lathe, milling machine, grinder, drillpress, or other metal-cutting machine. The Coolant Cup holds a supply of coolant or cutting oil, and permits it to flow to the cutting tool. Flow can be closely controlled or shut off as desired. A flexible metal hose permits quick positioning, and may be had 9.12 or 15 in. long. A shut-off cock is also supplied.

A special cast bracket holds the assembly on the toolpost of any lathe, and permits it to be lifted off and set to one side when not in use. The device is available in 1- or 2-qt. capacity.



The coolant cup can be mounted on any convenient machine projection

Chemox Safety Lungs Protect for One Hour

The chemical combination in the Chemox safety lung removes carbon dioxide from exhaled air. Outside air, which may contain poisonous fumes, is exhausted from the inhaled atmosphere

Chemox breathing apparatus, a product of Mine Safety Appliances Co., Braddock & Thomas Sts., Pittsburgh, Pa., generates its own oxygen, giving the wearer one-hour protection in unbreathable air. Designed to meet emergency where high concentrations of poisonous gas or oxygen deficiencies are encountered, a chemical combination in a replaceable canister creates oxygen when it is breathed into, removing carbon dioxide. Can be worn and operated without special training. Before canister is exhausted, a pre-set alarm bell rings a warning.

DO IT WITH A **DUOMATIC**

● How can you put out more lathe work in less time? The answer is: do it on a Duomatic. This automatic lathe has two carriages and tool slides, front and rear, operating independently or together. As a result you get two-lathe output with one machine.

In addition, the Duomatic is so fully automatic an unskilled operator can easily handle your most complex multiple tool jobs. The operator just puts in the work-piece, starts the cycle and the machine does the rest. The dual tool slides permit any combination of "in or out" turning and facing cycles, lengths and diameters are automatically determined. Simple dial and nut adjustments make cams unnecessary . . . saves two-thirds time on set-up changes.

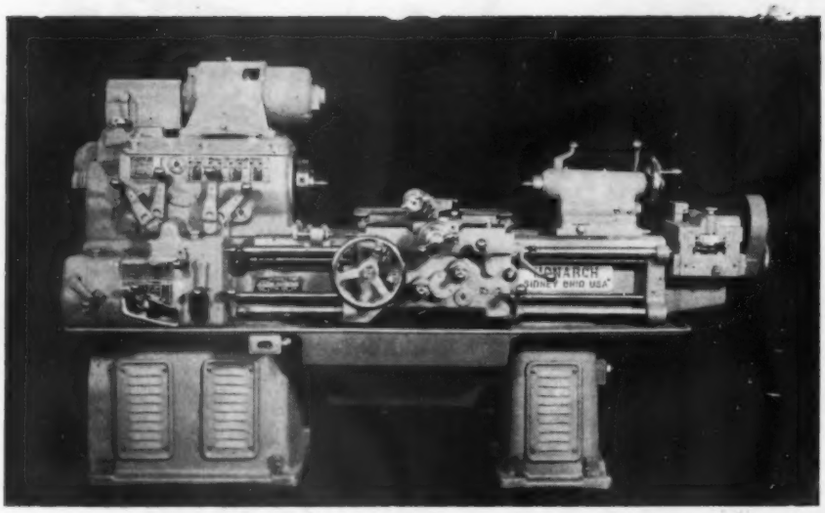
See for yourself how the Duomatic can save time and labor on your own work. L & S Engineers will gladly demonstrate for you. Write on your company letterhead for detailed literature No. 601 and 620.

THE LODGE & SHIPLEY MACHINE TOOL CO.

L & S LATHES

CINCINNATI 25, OHIO, U. S. A.

MACHINE TOOL DIVISION 3055 COLERAIN AVE. • SPECIAL PRODUCTS DIVISION 800 EVANS ST.



The leadscrew variating mechanism, which is adjustable to vary the lead of the slide as required by the shrinkage of the materials, is located at the end of the bed and can be set to vary the lead from standard in increments as small as 0.001 in. per in.

Monarch Toolmaker's Lathe Compensates Material Shrinkage

A universal toolmaker's lathe has been developed expressly for mold-makers by The Monarch Machine Tool Company, Sidney, Ohio. This mold-makers' toolroom lathe is available in a size corresponding to a 12-in. toolroom lathe, swinging 14½ in. over the bed, with a distance between centers of either 30 in. or 54 in. In addition to normal lathe features there are two improvements available. One is an adjustable-leadscrew variating-mechanism which can be adjusted to compensate for the shrinkage of the material being molded. When a thread is to be placed in a mold and extreme accuracy is required in the finished product, the lead of the thread must be greater in proportion to the shrinkage of the material. If the shrinkage of the material is 3%, the leadscrew variating mechanism can be so set, or if the shrinkage of the material to be molded is only 0.001 in. per 1.000 in., the leadscrew-variating mechanism can be set to compensate for this small amount of shrinkage. Then the thread can be chased to the mold following normal procedure.

Since many molds require miscellaneous internal and external milling operations, which many times must be performed at the single setting of the mold in a lathe, a speed reducer, which can be connected at will, is mounted on top of the normal headstock of the lathe to permit speeds as low as a fraction of a revolution per minute.

Besco Spot Welding Machine Welds With Tweezer Electrode

Besco tweezer spotwelding machine, manufactured by Tweezer-Weld Corp., 280 Plane St., Newark 2, N. J., is a portable unit. To the cabinet is connected a pair of insulated, forged copper tweezers and a foot switch. It plugs into 115-volt, 60-cycle power supply and may be adapted to 220-volt circuits. Application is for fabricating metal parts measuring 0.0005 to ⅛ in. round or thick.

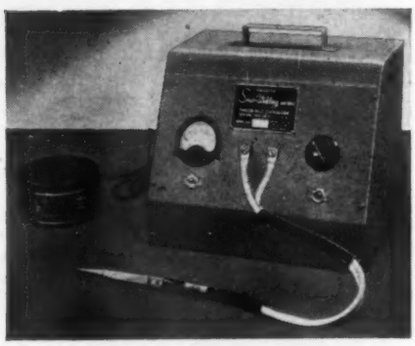
To weld parts from 0.015 in. through ⅛-in. round, the machine is used with an auxiliary booster unit which increases the capacity of the equipment by 300%. With the tweezers, the electrodes may not be applied directly to the elements to be joined. The tweezers probe for the parts, hold and bend them and weld.

Because the voltage used is low, and the current flows through the welding tweezers at about 1/1000 sec., the tweezers may be held in the hands with safety. They will not heat up in continuous use.

The tweezer leads are flexible, plastic-covered, and are 18 in. long. The points require touching up once a day.

To weld some types of heavy-gage metal where more pressure is required, the tweezers may be removed and the machine may be connected to a drillpress or hand arbor. Copper or copper-alloy rods may be inserted as electrodes with only the bottom electrode insulated.

For some problems, the tweezer tips may be shaped or filed to accommodate oddly formed units.



Optimus Cleaner Cuts Oil From Cement, Tile Floors

Optimus floor cleaner No. 1F10 is announced by Optimus Detergents Co., 150 Church St., Matawan, N. J. This product is compounded for use on cement, terazzo or tile floors. Although effective in removing oil, grease and other dirts from the surface, this material does not harm the finish. Optimus floor cleaner is a base from which a liquid floor cleaner can be made, or it can be applied to the surface directly, and then rinsed off.

Porciflex Baking Enamel Resists Acids, Alkalis and Oils

A fast-drying baking enamel has been developed by the H. V. Walker Co., Elizabeth, N. J. Porciflex, when applied to metal, gives a flexible finish which has a high resistance to acids, alkalis, oils and greases.

Applied by spray, roller-coating machine, or dip, it is baked at schedules from one minute at 450 F. for sheet steel to 15 min. at 275 F. for other types of work. It is well adapted to infra-red baking. Available in clear, black, white and all colors, the white Porciflex has a minimum tendency to yellow with age.

GEAR STEEL CHIPS at---

.....1½ lbs. a minute

Actually the job only took 50 seconds: To produce the 7 inch PD gear (left) from the forged blank (right).

That's the kind of performance which you can get only from the Michigan SHEAR-SPEED, which cuts all teeth simultaneously.

The 6-pitch gear above, with its 42 teeth of 1¼ inch face width was cut with just 82 strokes of the SHEAR-SPEED. Metal removed in those 50 seconds weighed 22 ounces.

That's Speed! Speed which makes the SHEAR-SPEED the first gear cutting machine equal to Michigan gear finishing machines in productivity per machine hour. And the gears produced are the equals in precision to gears cut in production by any gear cutting process.

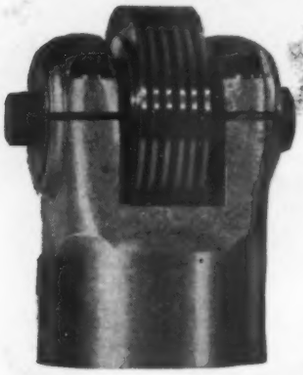
Michigan SHEAR-SPEED gear shapers are now available in a variety of standard sizes. For further information, write for Bulletin #1800-45.

ORIGINATORS of GEAR-SHAVING

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD DETROIT 12, U. S. A.

Crushed-process Dresser Utilizes Multiple Disks



Crush dressing centerless grinding wheels produce a surface with free points and a minimum of sheared particles

A multi-disk crushed-process dresser for trueing and dressing Cincinnati centerless grinding wheels is announced by the Mechanical Wheel Dresser Co., 4810 Whitfield Ave., Detroit 4, Mich. The crush-type dresser provides a fast cutting characteristic to the grinding wheel because it produces sharp, natural cutting edges.

GE Spatter-resistant Compounds Adhere Without Oil Removal

Weld-spatter-resistant compounds, Nos. 9951 and 9952, are a product of General Electric Co., Schenectady 5, N. Y. Both compounds are intended for use where weld spatter must be avoided. The compounds are furnished in powder form, ready to be mixed with water. The surface of the work, even though slightly oily, does not require wetting before the compounds can be applied. A special ingredient makes unnecessary a water-soluble binder to obtain adhesion.

Wear-resistant Alloy Used In Lifetime Gage Blocks

The lifetime gage-blocks manufactured by the DoAll Co., 1301 Washington Ave. S., Minneapolis 4, Minn, were developed to have improved wearing qualities. These advantages have been made possible by the use of DoAlloy, a wear-resistant alloy having expansion characteristics equivalent to steel, which permit using the blocks with a higher degree of accuracy under any temperature condition. They exceed in accuracy the standards set by the National Bureau of Standards, remain flat under severe temperature changes and retain accuracy through a temperature range of — 120 F. to + 500 F. The surface finish averages 0.5 r.m.s. and has a bright appearance.

All blocks of 0.250-in. size or smaller are made of solid DoAlloy. Blocks 0.300 in. and larger are faced with DoAlloy on wearing surfaces. This wear-resisting face is fused to a steel core in such a manner that it is impossible to separate them. The core is chemically treated to provide a jet-black finish which penetrates the surface. The blocks are acid-resistant.

Arc-maintaining Compound Helps When Current Is Low

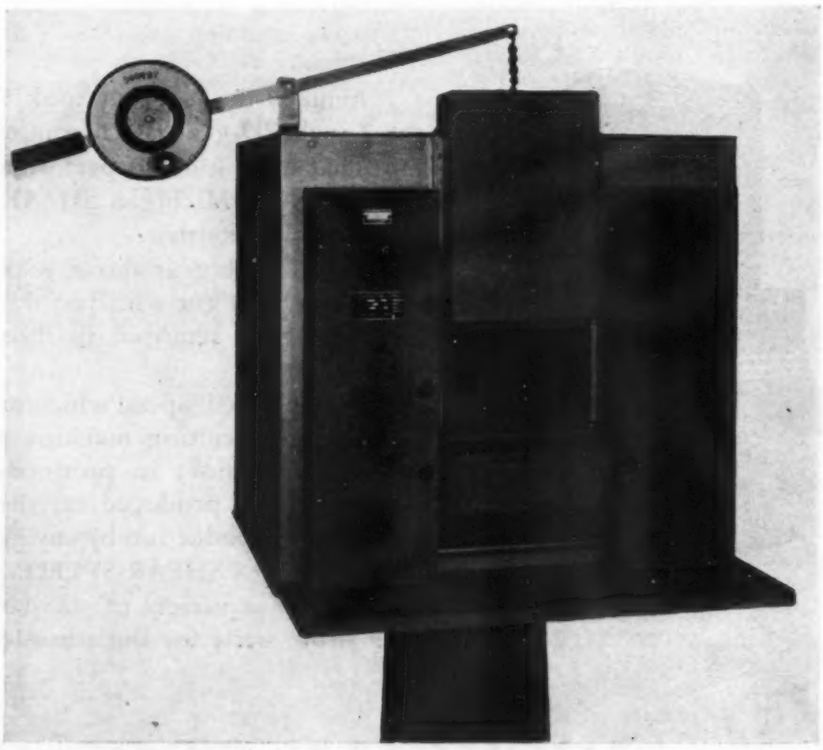
An arc-welding compound designed to aid in creating and maintaining a metallic welding arc where low currents and small-diameter electrodes are employed is announced by General Electric Co., Schenectady 5, N. Y. This compound, Strike-easy, is easily applied and can be used on any metal with any type electrode. The compound is available in paste form.

Sentry Hardening Furnaces Made in Larger Sizes

The Sentry Co., Foxboro, Mass., announces a larger size added to its line of Model Y high-speed steel-hardening furnaces. This model, known as Size 5, will have a muffle chamber 7-in. high x ⅞ in. wide x 20 in. deep. Through the use of larger sizes of Sentry diamond blocks, high-speed-steel tools up to 5 x 7 x 14 in. maximum size can be hardened.

Heating elements are located front to rear alongside the removable muffle chamber. Heating-element terminals are the same air-cooled type as on other Model Y furnaces. The furnace heating chamber is designed to reflect heat toward the muffle chamber opening to offset the tendency to cool at this point. Terminals and electrical connections are shielded and protected by removable metal guards. The furnace is rated at 42 kw. maximum and can be directly connected to a 220-volt, 3-phase supply without a transformer.

This furnace is supplied mounted on a cast iron pedestal. Over-all dimensions are 36 in. wide, 48 in. deep and 68 in. high, with the hearth 46 in. above the floor.



Minimum temperature variation in the Sentry hardening furnace is achieved by designs of the muffle heating chamber, which reflects heat to the front muffle opening and compensates for heat dissipation

They're Coming . . . 3 NEW MONARCHS

Watch for these names—your answer to *higher production at lower cost:*

"UNI-MATIC" . . . An automatic lathe with "production slides" (a revolutionary new principle) . . . and electronic control, universal tooling, universal positioning . . . for chucking and fixture work. *Maximum production of any machine known today.*

"MONA-MATIC" . . . A between-centers machine that makes automatic production *profitable* in any shop . . . *fully automatic, fully manual or any combination. Speeds up to 3000 rpm.*

"SPEED-MATIC" . . . A hand screw machine with automatic electronic speed change . . . 12 stations . . . *spindle speeds as high as 4000 and 5000 rpm.* We think you'll call it "*the World's Fastest Hand Screw Machine.*"

More details *here*—in April—and if you're buying metal-turning *capacity* before then, write us *first*—department 301.

THE MONARCH MACHINE TOOL CO. • SIDNEY, OHIO

ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

CycleLog Schedule Controller Maintains Preset Temperatures

For batch processes and other operations where rate of temperature increase or decrease must be controlled, as well as the actual processing temperature and duration, the Foxboro Co., Foxboro, Mass., has developed the CycleLog controller.

No time-cams or supplementary instruments are employed. CycleLog control is completely automatic, according to whatever schedule is predetermined, by adjustments of four setting knobs on the instrument panel.

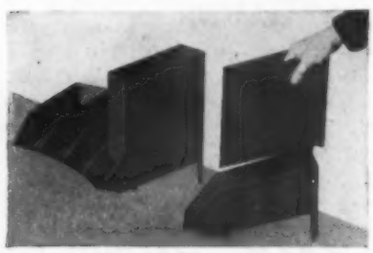
In batch dyeing, the CycleLog controller will bring the bath temperature up from any starting point, regardless of daily or seasonal variations, to the desired holding point, and do this at any desired rate of rise from 1 to 8 F. per min. It will then hold the bath at the correct temperature for the correct period of time, then shut off the heat supply and signal the operator that the cycle has been completed. By reference to the instrument chart and its notations, any cycle can be exactly duplicated as desired.

Keene Cutoff Cutters Substitute for Circular Styles

The Keene Valley Engineering Co., Keene Valley, N. Y., manufactures straight-shank cutoff and form cutters and adapter which permits these tools to be used in place of circular form tools for short runs. Cutoff, form, or combination cutoff and form tools are made to the user's specifications.

Steel Stackbin Quadruples Capacity of Assembly Bins

Stackbin Corp., Providence, R. I., has developed a hopper for assembly bins. The hopper increases the capacity of the bin four times. This equipment is made of heavy-gage sheet steel with welded construction. Finish is baked-on olive-green enamel. Attached to the assembly bin, it will remain rigid. It nests securely without fastening.



This Stackbin hopper increases the capacity of stackbins 4 times

The Globe deburring machine is available in three models. The single-compartment model has a content of 18.4 cu. ft. In the double-compartment model, each compartment has a capacity of 9 cu. ft. and in the triple-compartment model, each compartment contains 5.1 cu. ft. The unit occupies the same amount of floor space as smaller models

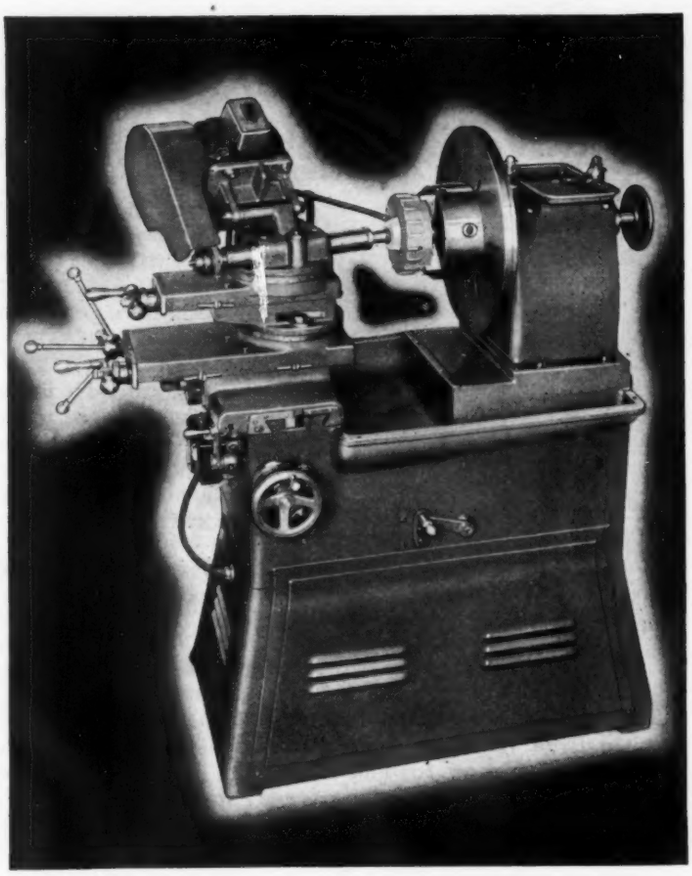
Globe Deburring Machines Made with Several Compartments

Designed to provide mass-production deburring by increasing output as much as 2100% over hand labor, the Burr-Rite machine manufactured by Globe Stamping Div., Hupp Motor Car Corp., Cleveland, Ohio, features double and triple compartments which can perform two operations, polishing and deburring, simultaneously.

The handling of parts has been simplified by the installation of a hoist pan. Large lightweight doors make loading and unloading easier. To maintain continued mass production, the large compartments can be relined with hard-maple liners without removing the hexagonal steel shell.

Each compartment is covered with a maple-lined steel door secured by a cross-bar and four hand units. Supporting structure consists of structural steel A-frames covered with a sheet metal apron. Bearings, motor and drive are protected from abrasive dusts. The motor is an enclosed type with an integral reducer. Switch system is wired in conduit and mounted at a convenient position.

The funnel end of the hoist pan fits into the compartment opening and facilitates loading. Casters and a bail handle notched for a crane hook are provided on the pan.



New 30" Swing!

New Slide Compound!

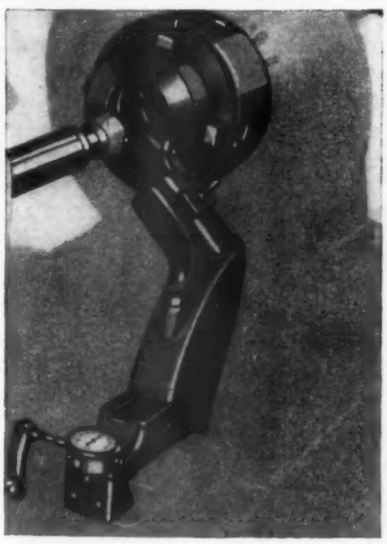
New Wheelhead Compound!

ON THE IMPROVED

LEMPCO

MODEL ACX GRINDER

Individual compound on the grinding wheelhead enables even the most difficult internal or external taper grinds or turns to be done easily and accurately. Workhead may be moved 6" toward or away from work, thereby increasing the swing from 18" to 30". Hand and power cross-feeds; 2 reversible spindle speeds of 80 and 130 R.P.M.; work length capacity up to 8". 2 H.P. motor in wheelhead (with ball bearing spindle) attains speeds of 6,000 and 12,000 R.P.M. Retractible tool holder bar enables finished grinding to follow turning operations without removing the cutter, or changing set-up.



AUTOMATIC *SIZING DEVICE...* enables operator to duplicate size of successive pieces exactly, regardless of wheel redressings. Available extra at nominal cost.

SPECIFICATIONS

Workhead Adjustment	6"
Work Spindle Speeds	80-130 R.P.M.
Carriage Feed	.020"
Swing	30"
Face Grinding	18"
Internal Grinding, Diameters up to	18"
Internal and External Grinding, Length	8"
I.D. or O.D. Turning Maximum	18"
Face Plate Diameter	18"
Carriage Travel	16"
Cross-Slide Travel	9"
Grinder Spindle Speeds	6,000 & 12,000 R.P.M.

★ *CEILING PRICED*

★ *GOOD DELIVERY*

★ *WRITE FOR CATALOG*

LEMPCO

5711 DUNHAM ROAD, BEDFORD, OHIO, U. S. A.

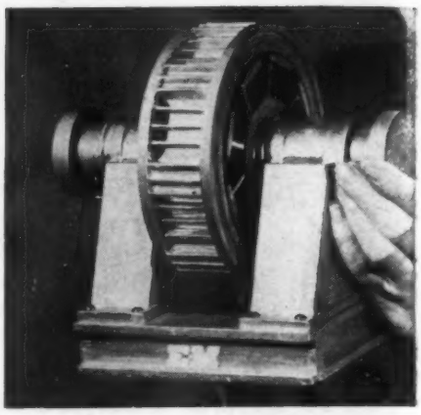
Lear Continuous Duty Motors Have Air-Cooled Open Laminators

A fan blade and open construction, to permit a large volume of air to pass through the components, cools the motor

A fan and open laminated construction provide cooling for the fractional horsepower motors manufactured by Lear, Inc., N. Ionia Ave., N.W., Grand Rapids, Mich., which are designed for continuous duty. The VC. type motors are rated at 125 volts ac. or dc. and have an output of 1/100 hp. at 7500 rpm. The motors are non-reversing, with clock-wise rotation of the shaft at the fan end. With a ½ in. stack, the VC. motor has an over-all length of 3 21/32-in., and is approximately 2⅛-in. dia. On the standard motors, the shaft at the fan end is fitted with a 15/32-in. pulley, although special shafts may be specified. The VD. motors are rated at 125 volt, ac. or dc., and have an output of 1/30 hp. at 7500 rpm. With a 1-in. stack, these motors have an overall length of 4⅜-in. and are 3 in. in diameter. Other specifications are similar to the VC. motors. The VD. standard motors are equipped with a ¾-in. pulley at the fan end. Rotation of the shaft is clockwise.

GE Flux Density Meter Measures Magnetic Force in Gauss Units

Utilizing a moving-magnet rotor at the end of an exploring prod, this instrument, a product of the General Electric Meter and Instrument Div., Lynn, Mass., permits flux to be measured at a single point in either air gap or iron structure. The latter measurement is accomplished by drilling a 0.090 in. hole in the iron and inserting the prod in this hole to check H in the iron. The small area of sensitivity at the end of the exploring prod allows the meter to be used in obtaining detailed analysis of flux distribution. For instrument work, prods 0.075 in. dia. and 1¼ in. long are furnished; for use with larger-apparatus, prods 5 in. long by 0.090 in. dia. are used. Indication of flux density in gauss is given on a 260° concentric scale.



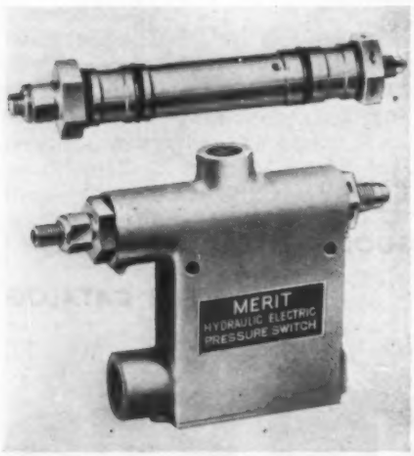
A rotating ring and rotating magnet are the moving components of the electro-magnetic drive

Split-Revolution Speed Control Possible with Magnetic Torque Transmitter

A precise speed control is provided by a magnetic adjustable speed drive announced by Electric Machinery Mfg. Co., Minneapolis, Minn. Consisting of two operating parts, a rotating ring and a rotating magnet, the drive is a self-contained electro-magnetic torque transmitter used with a constant speed ac. motor and an electronic controller, to provide split-revolution speed control. Built in ratings of 25 hp. and larger, at 1800 to 600 rpm., it can be used with synchronous motors to provide p.f. correction.

Uniform Torque Speed Range Electronically Controlled by Servotron

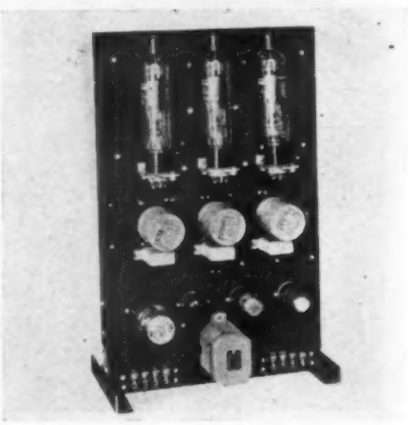
A variable-speed drive, Servotron, which controls speed electronically, is a product of the Submarine Signal Co., 160 State St., Boston, Mass. It operates on ac., and, through electronic controller, runs a dc. variable-speed motor. Maintains uniform torque over entire speed range.



Cartridge of the Merit hydraulic pressure switch unit is interchangeable with others to provide an operating range of 100 to 3200 psi.

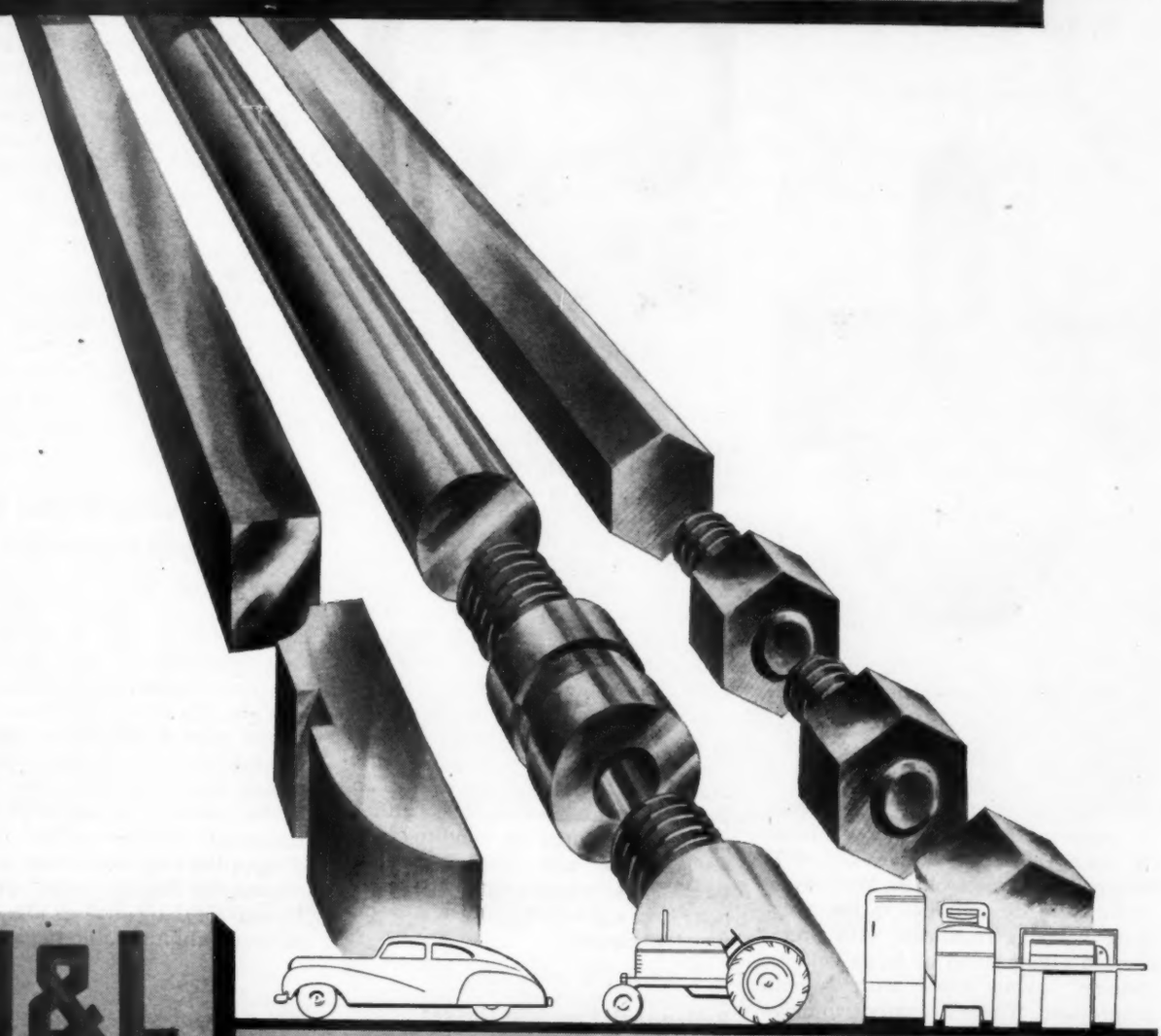
Merit Hydraulic Switch Unit Operates Electrical Equipment

The hydraulic-valve pressure-switch unit manufactured by Merit Engineering, Inc., Clifford St., Providence, R. I., is a self-contained cartridge that is renewable and interchangeable. An externally operated screen allows close adjustment without breaking the line. With two different spring cartridges, an operating range of 100 to 3200 psi. is available. The body of the switch is supplied in bronze or aluminum. Over-all dimensions are 4.5 x 4.08 x 1.14 in., and total weight with the aluminum body is 22 oz. The dc. switch is a single pole, single thrown, normally closed design with dc. rating 40 amps. 28 volts inductive load; 17 amps., 125 volts and 8½ amps. 250 volts non-inductive load.



J&L COLD FINISHED STEEL

FOR EASILY MACHINED · ACCURATE PARTS



J&L STEEL

In addition to improved machinability and longer tool life obtained through use of J&L Cold Finished steel, many manufacturers specify this precision product for its improved surface finish. They also obtain in J&L cold drawn and cold rolled bars and special shapes the higher physical qualities needed for parts of modern high-speed machines. J&L engineers and metallurgists will be glad to assist you with your production problems. Write or phone your nearest J&L office.

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH, PA.

Parts and Materials

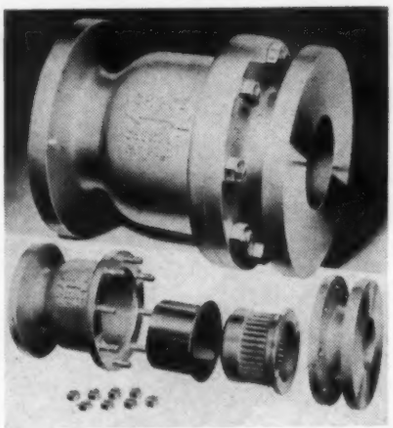
Air Piston Speed Controlled By Ross Air Volume Controller

Venturi incorporated in the poppet of the Ross valve proportions air volume

To provide control of the piston speed of the penumatic equipment on which it is used is the purpose of speed-control valve manufactured by Ross Operating Valve Co., 6477 Epworth Blvd., Detroit 10, Mich. Flow of air from the cylinder to the operating valve is regulated with precision, in either small or large volume, changes taking place with smooth progression. There are only two moving parts—stem and poppet—with the stem shaped to form a venturi for the passage of air in small volume.

Chexflo Flow Control Valve Prevents Reverse Pressure Impulses

Action of the Chexflo valve, manufactured by Grove Regulator Co., 6534 Green St., Oakland 8, Calif., is effected by a synthetic rubber tube stretched over a slotted, cup-shaped metal core, which expands to open and contracts to close. The expansible tube closes instantly on balanced flow, prior to the commencement of back flow, so there is never any tendency to establish pressure impulses, shock or water hammer through the flow line. The flexive tube possesses a uniform and constant spring rate which avoids inertia effects to cause operation beyond flow requirements. It improves in service due to the fact that flexing adds life to rubber. Because of its self-compensating and wear-resistant factors, this unit is particularly suited for handling highly corrosive and erosive gases or liquids. The supporting structure and body parts are available in any material necessary.



Rubber flexing tube, stretched over the slotted core, is prestressed and reacts to stop flow before the zero point of impulse reversal occurs

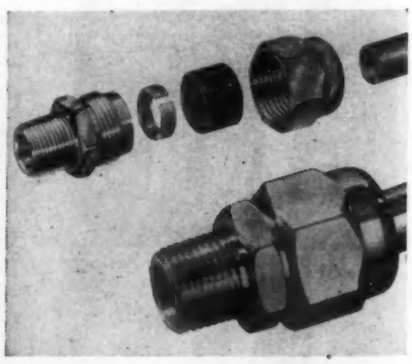
Bellowseal Pressure Gasket Seats by Internal Pressure

Surfaces of the gasket are pressed against sealing flanges by line pressure against the inner faces

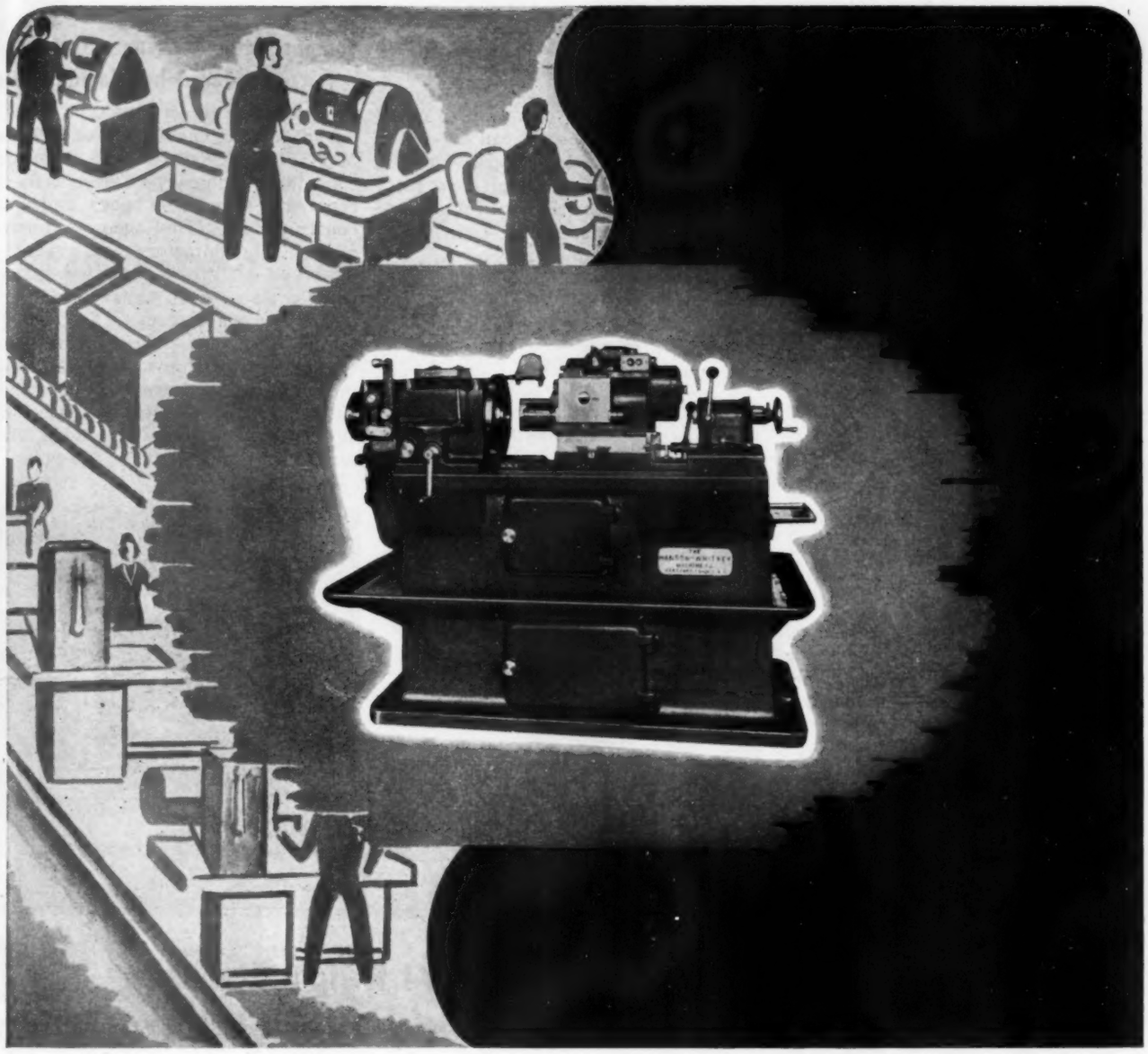
A serrated gasket, Bellowseal, is manufactured by Goetze Gasket & Packing Co., Inc., New Brunswick, N. J. The gasket uses the pressure to be sealed to exert a corresponding sealing pressure on the flange faces. It consists of the two disks of metal, (Armco iron, low-carbon steel, monel, or stainless steel), machined on external faces with standard serrations and welded together around outer periphery. It combines pressure and corrosion-resistant properties with the light bolting requirements of a soft sealing medium. Line pressure entering the interior of the gasket exerts expansion pressure in excess of the required sealing force.

Plain End Tubing Coupled With Flexgrip Compression Fitting

The Flexgrip fitting made by Gustin-Bacon Mfg. Co., Kansas City, Mo., in standard sizes from ⅛ in. to 1½ in. O.D., consists of four parts—body, gripping ring, synthetic rubber gasket and nut. To attach the fitting, the nut (with gasket and ring inside) is slipped over any plain-end tube. The tubing end is inserted into the body as far as it will go and the nut tightened. Tightening the nut compresses the ring and molds the gasket around the ring for a leak-proof seal. Flexgrip tubing fittings are available in brass, aluminum or steel.



Pressure of the coupling nuts causes the synthetic rubber gasket to expand and seal against the tube surface



POST WAR PRODUCTION LINES...

The Hanson Whitney Semi-Automatic Thread Miller offers the advantages of multiple cutters . . . perfect threads produced at high speed with maximum operating convenience. Saves precious time by producing finished threads . . . internal, external, or tapered, right or left hand . . . with minimum spoilage. Permits working of previously hard-to-thread materials with highest accuracy and precision. Pep-up production with an H-W Miller that is designed to do the job. Write or wire for complete information.

Hanson Whitney

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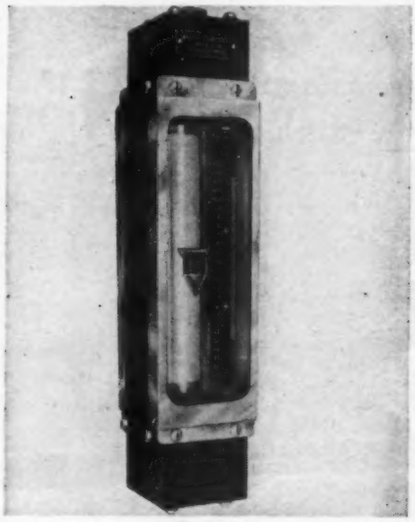
Fluid-pressure Changes Operate Electrical Switch

Changes in fluid pressure activate this electrical switch. Pressure differential of 5 to 15 psi. will operate it, and temperature can be as high as 300 F.

An electrical control switch, manufactured by Mu-Switch Corp., Pequit St., Canton, Mass., is actuated by changes in fluid pressure and provides a means for regulating or indicating fluid pressures, or for controlling circuits operated by pressure changes of a liquid or gas. Electrical control element is a standard single-pole, double-throw switch. Type M switch is rated at 15 amp., 125 volts ac. to 2 amp. 600 volts ac. or ½ hp. at voltages up to 460 ac. For low voltage dc. applications, standard Type A switch has a maximm current rating of 25 amp. at 28 volts dc. Unit can be furnished for operation with a differential of 5 to 15 lb. at nominal ratings of 10 to 120 psi. Pressure chamber is made of a corrosion and heat-resisting material. The unit can be safely operated at temperatures up to 300 F., and can withstand severe vibration.

Full-view Rotameter Provides Flow Measurement

A full-view rotameter with safety shielding, manufactured by Brooks Rotameter Co., Landsdale, Pa., is for accurate flow-rate measurement and control. Shielding is obtained by front and back safety glass windows with stainless-steel frames. All surfaces are gasketed to prevent leakage. Equipped with an interchangeable precision metering tube, the space between side plates is wide, allowing float position to be read from an angle. Meter parts are treated to prevent external corrosion. With metal tapered tube, it can be used for pressures up to 600 psi. Device can be obtained as a simple flow rate indicator, or with remote instrument for recording or recording-controlling flow rate. Flow totalization also can be included.

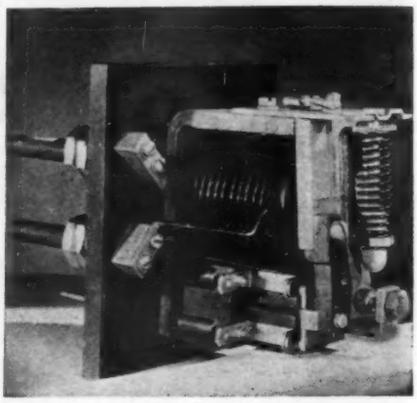


Pressures up to 600 psi. can be handled by this metal-tube rotameter, and flow totalization can be included

Compact Magnetic Contactors Produced by Westinghouse

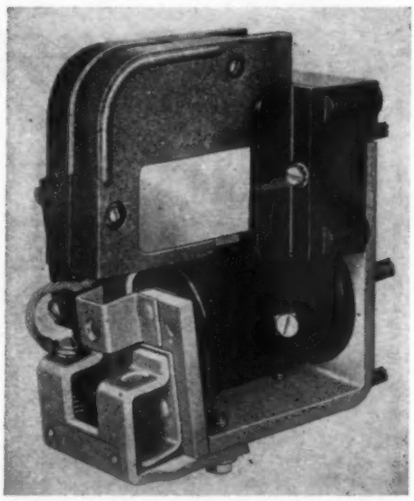
Westinghouse Electric Corp., Pittsburgh 30, Pa., manufactures a Type M line of dc. single-pole magnetic contactors. Compact in design these contactors save panel space, and unit construction assures accurate alignment. The contactors are available in rear- or front-connected units, with small or deep frames.

Small-frame contactors are limited to 250 volts, while deep-frame contactors are rated up to 600 volts. The operating coils are rated for continuous duty and will operate the contactors at from 80 to 110% rated voltage. The contacts are insulated for 600 volts.



Westinghouse AYI Relay for DC. Provides Magnetic Overload Protection

To provide magnetic overload protection on general-purpose and mill-motor applications and to prevent damage to hoist, windlass, and capstan equipment when the load or cable jams, AYI relay for dc. operation is announced by Westinghouse Electric Corp., Pittsburgh 30, Pa. The single-break, normally closed main contacts and the double-break auxiliary contacts are suitable for carrying 5 amp. continuously, and for interrupting a dc. inductive coil lead of 150-va. maximum. Relays are operated by a series of copper strap-wound coils for currents ranging from 75 to 625 amp. The coils and auxiliary contact parts are insulated from the relay frames for 600 volts. Ground armature and frame surfaces are plated with hard chromium for protection against corrosion in service under such atmospheric conditions as might otherwise cause trouble.



Continuous current-carrying capacity of this unit is 5 amp., and it can interrupt a dc. non-inductive coil lead of 150 va. Operating coils can be 75 to 625 amp.

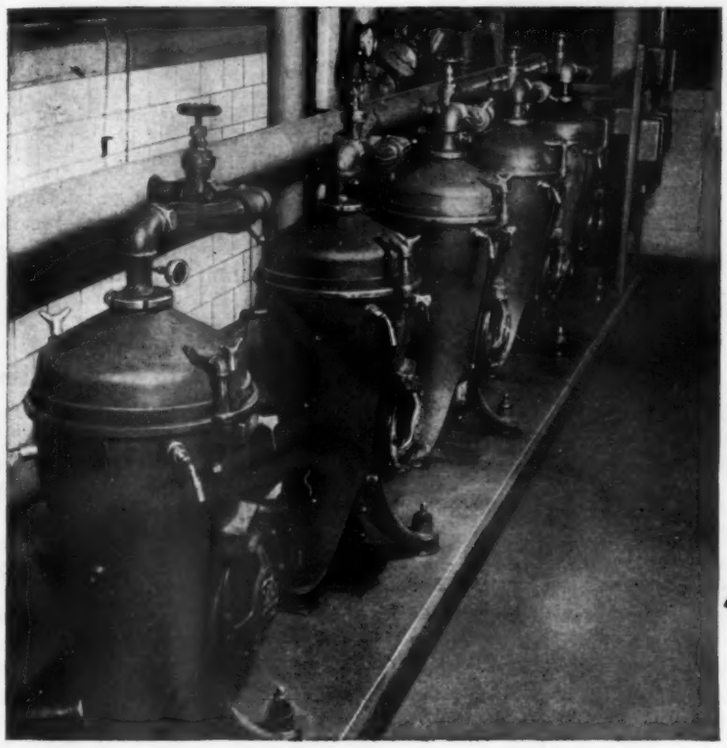
1 De Laval "Hermetic" Clarifier handles all types of oil and aqueous coolants.

2 De Laval Clarifier keeps grinding coolant free from abrasive and metallic sediment.

3 Speeds up grinding operations—machinist can grind nearer to finish dimensions with less likelihood of distorting the work.

4 Removes soft bonding material as well as metallic particles. Helps resist rancidity.

5 Minimizes wheel dressing; prolongs wheel life.



5 "PAY DIRT" ADVANTAGES OF DE LAVAL COOLANT CLARIFIERS

DE LAVAL Coolant Clarifiers keep grinding coolant clean by means of centrifugal force. Multiplying the separation effect of gravity thousands of times, De Laval centrifugals make it possible to remove—continuously—the abrasive and metallic particles that ruin coolant.

Less time is required for finishing processes, and grinder maintenance and time lost for tool set ups are both reduced. De Laval Coolant Clarifiers soon pay for themselves where greater grinding speed and better finishes are among the most important considerations.

De Laval "Hermetic" Coolant Clarifiers feed and discharge the liquid under pressure, eliminating foaming. After clarification the coolant is ready to be pumped directly back to the work.

De Laval Clarifiers are adapted both to plants having centralized grinding systems and those where individual grinders are used. Write for Bulletin FG-17.

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 19
THE DE LAVAL COMPANY, Limited
MONTREAL PETERBOROUGH WINNIPEG VANCOUVER

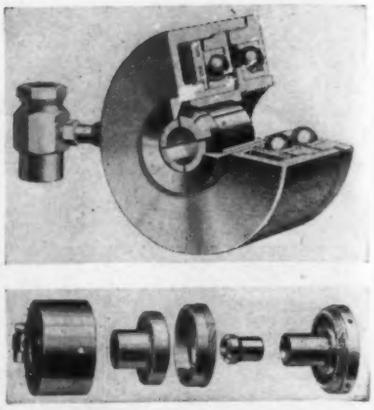
De Laval

"Hermetic" COOLANT CLARIFIERS

Warehouse Handling Time Decreased by Handibelt Conveyor

The Handibelt conveyor is a self-powered unit that can be adjusted to any desirable angle without use of tools. The belt can be set in horizontal position and used as a pusher to provide power to gravity type conveyors

The Handibelt, manufactured by Standard Conveyor Co., North St. Paul 9, Minn., is an all-purpose portable belt conveyor for carrying bags, boxes, crates, cartons, and other commodities. It is adjustable to inclined, declined, or horizontal positions, and can carry products wider than the belt. Has capacity for 110-lb. bags or boxes, or a continuous load of 20 lb. per ft. As a horizontal conveyor it can be used as an individual unit to reach from one fixed position to another, as a connecting link between other conveyors, or as a feeder conveyor. Any number of units can be placed in line to reach remote storage spaces. One person can move the machine into position and adjust the belt table to any angle.



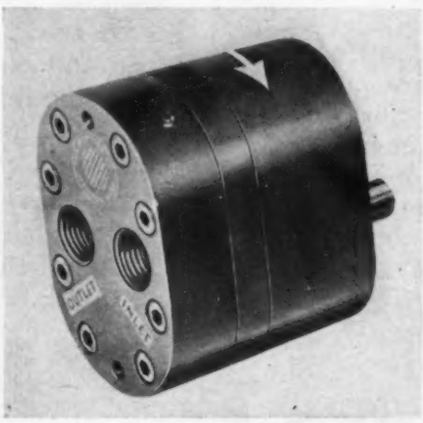
Axial and radial ball thrust bearing in the Erickson air-operated collet maintain accurate alignment and decrease operating friction

Air-operated Speed Chuck Added to Erickson Line

Erickson Tool Div., Erickson Steel Co., 2309 Hamilton Ave., Cleveland, Ohio, has added to its line of precision collet chucks and expanding mandrels an air-operated speed chuck. Accurate clamping over the collapsing range of 1/32 in. makes it possible for this chuck to take the place of seven standard-size single-purpose collets. The matching angular surfaces of the chuck shank and collet provide accuracy and gripping power. The chuck is available in either foot-valve or hand-operated models, and is adaptable to any spindle. Model 4AT chuck has a range of ⅛ to 1 in. and the Model 6AT chuck has a range of 1 to 2 in.

High Pressure-Volumes Obtained With Small McIntyre Gear Pump

A compact gear pump manufactured by McIntyre Co., 15 Riverdale Ave., Newton 58, Mass., will deliver from ½ to 3 gpm. (at 1750 rpm.) for continuous duty at pressures to 1000 psi. The pump is of rotary spur gear design. Over-all dimensions are: height 3¼ in., width 2¼ in., depth 2¾ in., weight 1¾ lb. All Series 100 pumps operate with a minimum volumetric efficiency of 90% at 1000 psi. when using oil of SSU viscosity at 100 F. These pumps are of aluminum construction with Nitralloy gears and shafts. By using plastic housings and stainless steel gears and shafts, the pumps can be used to handle water and mild corrosives. Standard models are supplied for direct motor, flexible coupled drive but can be supplied for

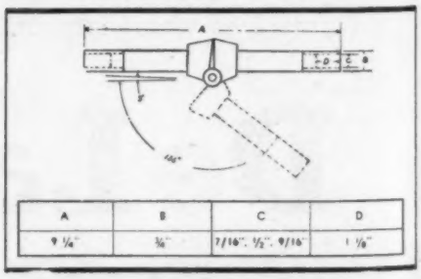


all types of standard drives and mounting conditions. Power requirements vary between 0.40 and 2.25 hp. for the various units at 1000 psi.

Both inlet and outlet couplings are at one end of the housing to facilitate flush mounting.

Prior Pivot Gear Joint Maintains Coustan Velocity Ratio

This joint manufactured by Gray & Prior Machine Co., Windsor St., Hartford 5, Conn., comprises alloy-steel heat-treated gears in a drop-forged housing and operates in any position between 3° to 139°. The unit is for manually operated remote controls.



A	B	C	D
9 ¼"	⅜"	7/16", ½", 9/16"	1 ⅛"

Hinge axis of the Prior angular drive is placed to maintain constant gear ratio

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SEEN and HEARD

Etching—A Remedy

MANY ADVOCATE that milling cutters and other tools should be marked with data as to the kind of material of which it is made, cutting angles for the guidance of the tool grinding department, cutting speeds, and, in some instances, the job for which it is intended. Sad experience with cracks developing in hardening and apparently starting from the stamped markings, make tool men object to running risks of this kind. The remedy seems to be to have the tools marked by etching, either electrically or with acids. This can be done by either method after the tool is hardened, and imposes no stresses on the material of which the tool is made. Many tools are too small to be marked by either method and information concerning them must be put on the container in which they are kept. Because of increasing types of tool material, it seems necessary to know what is in the material of each of the types of the various tools we use.

Measurement Loses 'Feel'

WE HAVE COME a long ways since the days when firm-joint calipers, inside and outside, were our main methods of measurement. Then came verniers, micrometers, flush-pin and fixed gages, all depending to some extent, on the "feel" of the one doing the measuring. And some of the old time mechanics had a "feel" that was amazingly sensitive. The way in which they would make press or shrink fits with nothing but firm joint calipers, is almost unbelieveable. Even with fixed caliper or other gages, feel has much to do with securing interchangeability, when different people do the gaging.

One instance that comes to mind is the grinding of some motor shafts for a well known electrical manufacturer. The shafts were rejected as being too small, because of a difference in the "feel" used by the two companies. The grinder let the caliper gage drop over by its own weight. Motor production men used considerable pressure to force it over the shaft, which made an appreciable difference in the diameter.

And to show how much pressure affects measurements, we note that it enters into consideration with electronic gages, one of the latest of our

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THIS LITTLE FILE stayed home

THE files that "go to market" under the world-famous Nicholson and Black Diamond trade-marks are only those which can uphold the long-standing Nicholson guarantee of *Twelve perfect files in every dozen.*

Those which "stay home"— the rejects — are the few which fail to pass the score or more of meticulous tests and inspections that guard the various manufacturing stages.

The testing operation illustrated above is one of many. Here, for example, triangular files are being checked, one by one, with a dial gauge to see that edges are uniformly correct in width.

Relentless inspection of steel; forging, grinding and drawfiling inspections — to see that every blank is correctly shaped, even and smooth before cutting; annealing and hardening tests; magnified teeth inspection; tests of soundness; tests of cutting qualities . . . are a few of the other precautions taken to maintain Nicholson and Black Diamond file quality as the highest in the world.

SERVICE AND SUPPLY. Mill-supply houses handling Nicholson or Black Diamond file brands are chosen under the test of high standing, the capacity to carry representative assortments of file types and sizes, and the ability to render genuinely helpful file-selection service to industrial concerns.

NICHOLSON U.S.A. **NICHOLSON FILE CO., 29 ACORN STREET • PROVIDENCE 1, RHODE ISLAND** BLACK DIAMOND TRADE MARK

(In Canada, Port Hope, Ont.)

NICHOLSON FILES *FOR EVERY PURPOSE*

CONTROLLED throughout . .

"MONARCH" Lathe
. . . Bijur-Equipped.

The correct oil film to each individual bearing... automatically

■ **LUBRICATION CONTROL is of utmost importance in maintaining maximum output. Control must be positive—at all times. With a Bijur lubricator on the job, manpower is concentrated on actual production. The machine practically takes care of itself over long periods of operation.**

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measuring methods. Here the very slight movement of the measuring point as the work touches it, generates a current which shows the movement on a greatly amplified scale. These readings, which may run into millionths of an inch, depend on the pressure to which the instrument is set. The standard contact pressure is one lb. or 16 oz., but can be made as low as 2 oz. if desired. This indicates that contact pressure is still a factor, whether with the old caliper or the later electronic device.

The only case in which pressure is not a factor is in comparators where greatly enlarged outlines are matched with standard forms on some sort of a screen, usually of ground glass. These are, however, usually confined to determining forms or contours rather than dimensions. "Feel" has however, been removed from the fingers of the individual and is definitely measured in ounces in the newer measuring devices.

Views on Babbitt Metal

CONTROVERSY as to what constitutes real, or true babbitt metal has extended over many years. According to some a mixture of 8 parts copper and 92 parts tin, is the real babbitt. Other mixtures contain antimony and some lead. Going back to Haswell's Engineers Pocket Book of 1855 we find:

"Melt 4 pounds of copper with 12 pounds of Bavea tin. Stir in 8 pounds of antimony and then add 12 pounds more of tin. Using this as a base melt *one* pound of this mixture with *two* pounds of Bavea tin as the metal to use in bearings."

This does some odd things to the relation between the copper, antimony and tin. In the first mixture we have 4 copper, 8 antimony and 24 tin. But adding 2 pounds of tin to one pound of this base mixture makes the mixture 4 copper, 8 antimony and 96 tin —believe it or not—quite different from what we have come to call "original babbitt" metal.

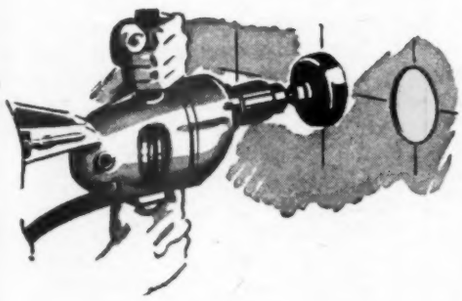
Idle Machines By Plan

PLANNED IDLENESS of production machines seems incongruous, but experienced shop managers will agree that reserve machine capacity is a mighty important consideration. Unless each operation can be timed perfectly and tools never dull too soon or break, 100% operation of every machine is a dream that never comes true.

Many managers plan work so there will be a reserve capacity of machines at all times. This allows

• • with Black & Decker HOLE SAWS

Inexpensively cut, clean round holes are needed on hundreds of jobs in your operations today. Such jobs as modernizing buildings . . . laying new piping . . . changing wiring . . . installing new heating, refrigerating and air conditioning systems . . . putting new accessories on machines and automotive equipment . . . insulating plants . . . setting up new production lines . . . and many others.



Using Black & Decker Hole Saws is a sure-fire way to hold down costs on these jobs. These clean-cutting saws are made in 27 different sizes, to cut absolutely round holes from ¾" to 4" in any material a hack-saw will cut . . . *a lot faster!* Drive them with Black & Decker or *any other* portable electric drill.

See your nearby Black & Decker Distributor about your Hole Saw needs. For complete catalog giving detailed information on more than 100 Black & Decker Portable Electric Tools, write to: The Black & Decker Mfg. Co., 616 Pennsylvania Ave., Towson 4, Maryland.

Use Fine Tooth Tungsten Hole Saws For Sheet Metal, Steel, Porcelain and all thin material.

Use Coarse Tooth Tungsten Hole Saws For Wood, Fibre, Bakelite, Cast Iron and all thick, coarse materials.

Use High-Speed Steel Hole Saws For Hard Alloys and for longer life on production work.

LEADING DISTRIBUTORS EVERYWHERE SELL

Black & Decker

PORTABLE ELECTRIC **TOOLS**

WENDT-SONIS CARBIDE TIPPED Inserted Tooth Cutter

Requires up to 30% LESS POWER than ordinary cutters

- **USE ON PRESENT MACHINES.** W-S Inserted Tooth Cutters are designed for high efficiency on your present machines.
- **MILL ALL TYPES MATERIAL** with only the one cutter body. Simply change blades. New principle permits faster blade changes.
- **MAINTENANCE COSTS ARE LOW** because blades are easily sharpened and inserted. Long service life.
- **REFER TO "TOOLS"** in your Classified Directory for local W-S Distributor or write Wendt-Sonis Company, Hannibal, Missouri. Branch Warehouse: Long Beach, California

Free!
W-S SPEED and FEED CALCULATOR for Carbide Cutters — Gives correct feed per tooth per r.p.m. Also gives basic rough and finish cuts for all materials. Write on business letterhead for your FREE Wendt-Sonis Calculator.

W-S FACTORY TRAINING COURSE, *FREE!* One week's intensive training, at our factory, in application, use and maintenance of carbide cutting tools. Small classes, individual instruction. Practical facts, actual shop practice. Write for details.

WENDT SONIS
CARBIDE TIPPED CUTTING TOOLS
BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS • DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS • ROLLER TURNING TOOLS • SPECIAL TOOLS

for any unforeseen delays, such as tool breakage. For example, one top-notch manager loads his machine equipment to only 65% of its capacity. Other types of equipment might not require as wide a margin, but he feels this is a safe figure for the average contract shop.

Experiences with reserve capacity from a variety of shops would be of value to all who handle contract work. Let's hear from you.

NEW BOOKS

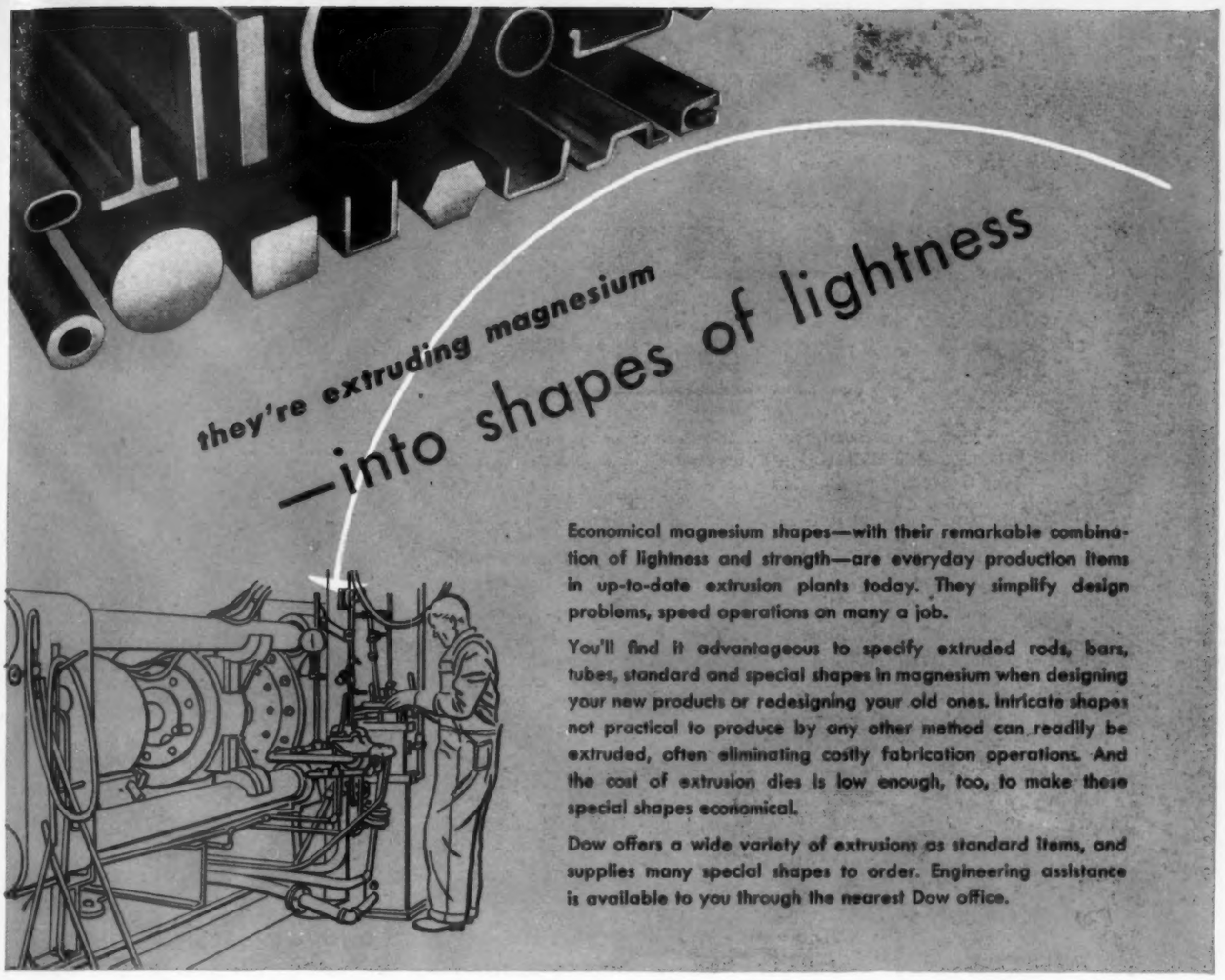
MOVING AHEAD ON YOUR JOB—By Richard P. Calhoon, personnel director, Kendall Mills. 295 pages 5½x8 in. Published by the McGraw-Hill Book Co., Inc., New York 18, N. Y. Price $2.75.

"This book aims to help men and women who are truly serious in their desire to get ahead in business . . . those returning from the armed services . . . minor supervisors and ambitious workers who seem to be getting nowhere . . . " So Mr. Calhoon describes his purpose. He admits it is heavy going—no chit chat—and that it should be read a little at a time, a chapter at a sitting at most.

Actually, this reviewer found the book easy reading. Mr. Calhoon talks about the "boss man", the gang, about "queeries", and in general uses ordinary lingo. He makes no effort to impress, but talks and thinks straight. Most "success" books resort to pompous lecturing and highly inspirational drivel. Calhoon gives the impression he's been through what he's talking about and is sincerely trying to help. His 48 chapter headings are really key points in a program, each a word or short phrase, such as: Belong, Carry the Ball, Know Your Rights, Understand Folks.

Each chapter is in turn broken by appropriate subheads, for example, in the 5-page chapter titled, "Produce —Don't Politick," the subheads are: Politicking Is a Temptation, Digging Cellars Does Not Pay, Speak Well of Those in Business With You, Build on a Solid Foundation. Each such point is explained and discussed in straightforward terms, then highlights are summarized at the end of the chapter.

Here is a refreshing book on a difficult subject, one that doesn't hedge, preach or gloss over. It gives inspiration without being namby-pamby, suggests the way up without kowtowing. It is worth reading and re-reading as a guidebook.



Economical magnesium shapes—with their remarkable combination of lightness and strength—are everyday production items in up-to-date extrusion plants today. They simplify design problems, speed operations on many a job.

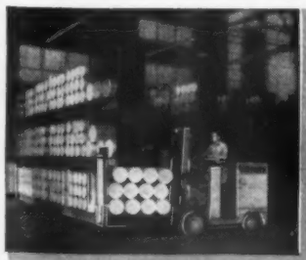
You'll find it advantageous to specify extruded rods, bars, tubes, standard and special shapes in magnesium when designing your new products or redesigning your old ones. Intricate shapes not practical to produce by any other method can readily be extruded, often eliminating costly fabrication operations. And the cost of extrusion dies is low enough, too, to make these special shapes economical.

Dow offers a wide variety of extrusions as standard items, and supplies many special shapes to order. Engineering assistance is available to you through the nearest Dow office.

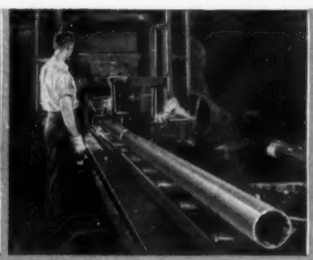
Ready... to make products move!

MAGNESIUM

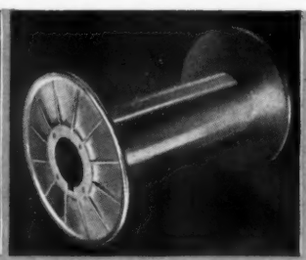
LIGHTEST OF ALL STRUCTURAL METALS



Dow's complete magnesium line includes a variety of alloys specially prepared for extrusion; also extrusions of many kinds.



Thirty years of leadership in the magnesium field enables Dow to offer complete technical aid in all phases of its application.



Extruded magnesium tubing forms the barrel of this lightweight warp beam, used on modern high-speed textile equipment.

MAGNESIUM DIVISION • THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • Chicago • St. Louis • Houston • San Francisco • Los Angeles • Seattle

OSBORN'S new "miracle" Situft, latest addition to the largest power brush "family" in the world, has been chosen by Pennsylvania Central Airlines to service the famous "Capitaliners" which speed travelers daily from Washington to Chicago.

The Situft literally flies through work which previously was much slower; in the illustration, for instance, removing carbon and still leaving an essential satin-smooth finish on bronze exhaust valve guides of their high-speed Cyclone motors.

This is just one application among thousands, in diversified industries, on diversified products—where the new Osborn Situft has *proved* it can get at the hard-to-reach and "impossible"-to-reach internal surfaces which require original or periodic surface finishing.

The new Situft is a power brush like none you've ever seen before. It's built on an entirely new principle of wire suspension. Its cost is almost unbelievably low—only 17¢ per brush—yet it has already saved thousands of dollars in production costs, thousands of hours of time.

A complete tool crib kit containing one each of all 12 sizes (¼" to 1¼") and 2 holders costs only $2.85. You ought to have one. Kits and open stock available from your local Osborn distributor.

THE OSBORN MANUFACTURING COMPANY
5401 Hamilton Avenue *Cleveland, Ohio*
WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY

Osborn Brushes

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ARE you already using, *or planning to use,* the tremendous capacity of stainless steel to improve products or solve processing problems? In either case, you'll find extra values in Allegheny Metal that are natural outgrowths of pioneering and production leadership . . . extra qualities of uniformity, breadth of selection and technical cooperation that will make a real, dollar-and-cents difference to you. When you're thinking of stainless steel, think *first* of Allegheny Metal—call us in to research *for* you and work *with* you.

- Allegheny Metal is also handled—and carried in stock for prompt shipment—by all Ryerson Warehouses.

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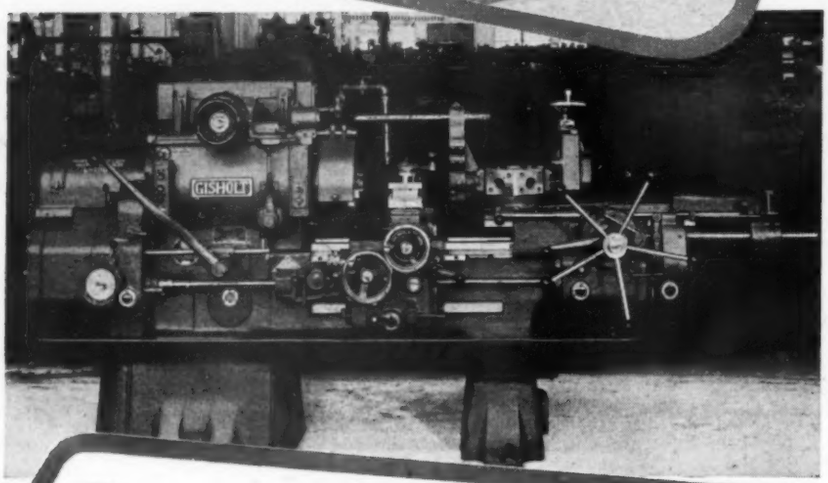
STEEL CORPORATION · General Offices, Brackenridge, Pa.

Specialloy Steels - EXCLUSIVELY

The makers of famous Gisholt Lathes guard their reputation for dependability and durability — with parts of Ampco Metal



Protection Against Shut-downs due to metal failures

Machine tool parts of wear-resisting Ampco Metal

. . . a series of aluminum bronze alloys — tailor-made to meet severe operating requirements

Five grades and a number of modifications of Ampco Metal enable machine tool builders to secure exactly the properties they need for a specific application. That's why so many of them (over 90 leaders) standardize on parts of Ampco Metal, to protect you against costly "down time" for repairs due to metal failures.

With controlled physical properties varying from ductile and soft to rigid and hard, Ampco Metal lasts several times as long as ordinary bronzes. All variations retain Ampco's distinctive characteristics: Controlled hardness. High tensile and compressive strength. Stubborn resistance to wear, shock, impact, fatigue, "squashing out." Good bearing characteristics.

Check for parts of Ampco Metal, as a mark of quality in the machines you buy. And insist that replacement parts for your older machines be made of durable, wear-resistant Ampco.

AMPCO Metal
The Metal without an Equal

A.M. 3

FREE! "File 41 — Engineering Data Sheets" illustrates and describes many applications using various grades of Ampco Metal successfully. Shows you why it's good business to check for parts of Ampco Metal in specifications of the machine tools you buy. Fill in the coupon for your free copy.

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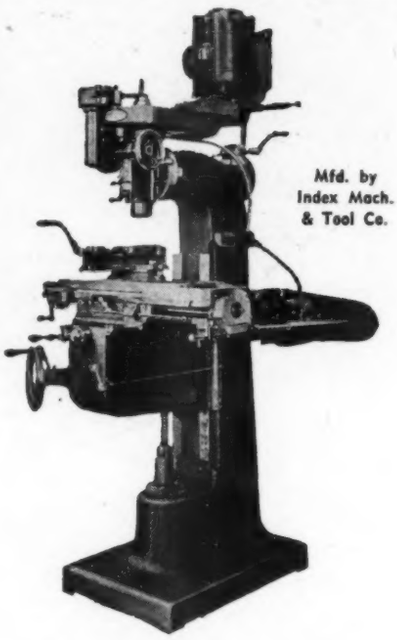
will help you on your tool, die and production work. In addition to micrometer dials on screws, verniers are standard equipment for cross and longitudinal locating. If finer precision is desired, rods and indicators are available. These in conjunction with power feed to a precision ball bearing spindle make a very versatile machine for milling, drilling and boring. *Literature promptly mailed on request.*



Mfd. by Index Mach. & Tool Co.

12" Tool Room Rotary Table

A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

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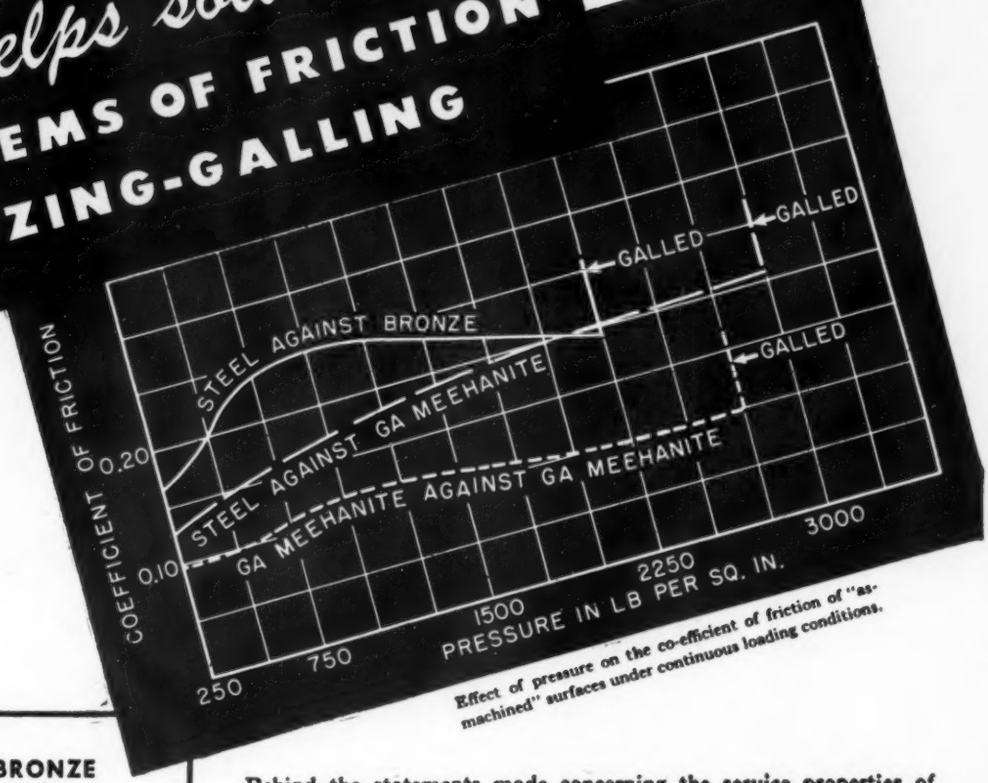
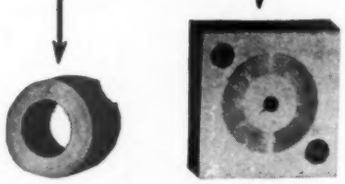
MEEHANITE RESEARCH *helps solve* PROBLEMS OF FRICTION SEIZING-GALLING



Effect of pressure on the co-efficient of friction of "as-machined" surfaces under continuous loading conditions.

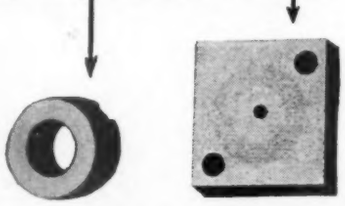
1 STEEL Against BRONZE



Rolled steel SAE 1035 containing 1.56 manganese

Navy M bronze containing 88% copper, 6% tin, 1.5% lead, 4.5% zinc.

2 GA MEEHANITE & STEEL



1 Appearance of bronze and steel bearing surfaces after test using "conditioned" steel to final pressure of 2,500 lb. p.s.i. Wear and galling evident on bearing surfaces.

2 Appearance of Meehanite bearing surfaces after test using "conditioned" steel to final pressure of 6,000 lb. p.s.i. No indication of wear on bearing surfaces.

Behind the statements made concerning the service properties of Meehanite Castings is always an accumulation of research and investigation. Such activities are a primary function of the manufacturers of Meehanite Castings.

The chart above is a result of extensive tests on the effect of pressure on rubbing surfaces under continuous loading conditions.

These investigations have revealed that the chief causes of metal pickup, seizing and galling are:

1 Incorrect structural constitution of the metals employed.
2 Rough or inaccurate machining.
3 Improper selection of surface finishes.
4 Inadequate clearances.
5 Overload such as is caused by poor alignment, etc.
6 Faulty lubrication.
7 Uncontrolled temperature conditions.
8 Careless "running-in" during the "break-in" period.

Meehanite Castings provide proper structural constitution through regulation of the micro constituents. In addition their machinability and constitution permit highly accurate machining and the attainment of the desired service. Their carefully regulated graphitic content contributes something to lubrication. These properties are responsible for the extensive use of Meehanite in machine parts requiring resistance to surface friction, sliding wear, pick-up and galling.

Write for Bulletin No. 17 "A Study of Friction, Galling & Seizing."

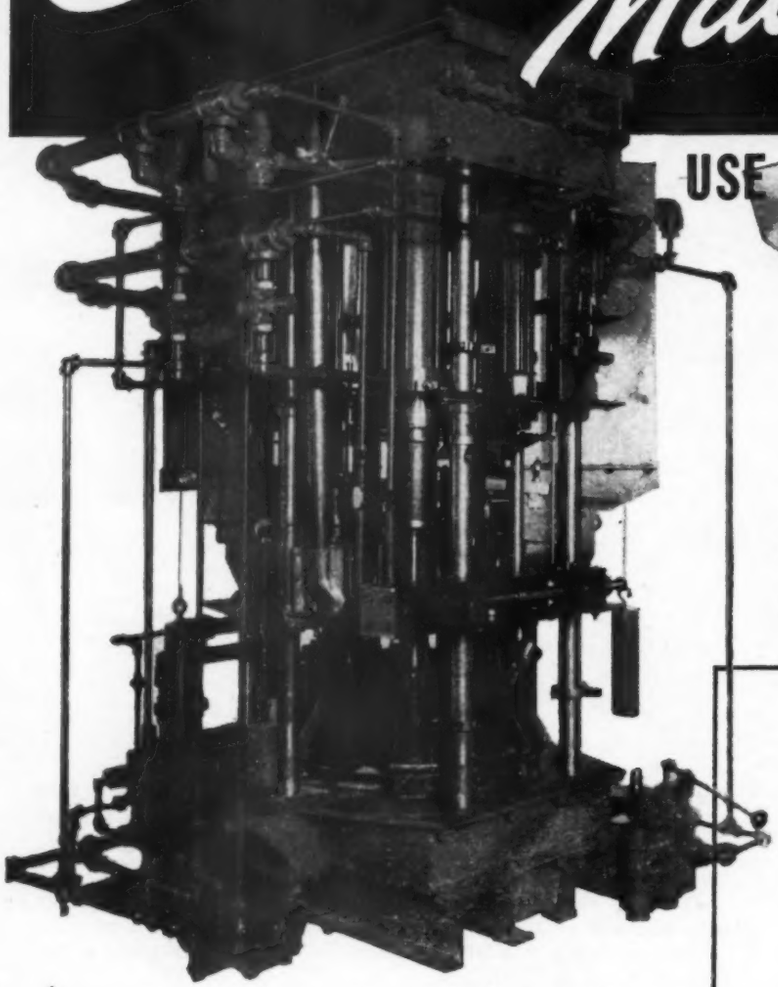
MEEHANITE RESEARCH INSTITUTE
Pershing Square Building
NEW ROCHELLE, NEW YORK

NOW IT CAN BE TOLD

Shell-loading Machines-

USE T-J

CYLINDERS



T-J Hydraulic Cylinders on these machines press different ingredients into shells at very accurate pressures. At left, rotary type press—which also employs small cylinder (shown on front) for indexing. Below, "straight eight" type loading press.

Among the wide range of war production jobs performed by T-J Cylinders is this application on shell-loading machines manufactured by Proctor & Schwartz, Inc., Philadelphia. The machines are hydraulically operated and *entirely automatic*—depending on the high efficiency and accuracy of T-J Cylinders!

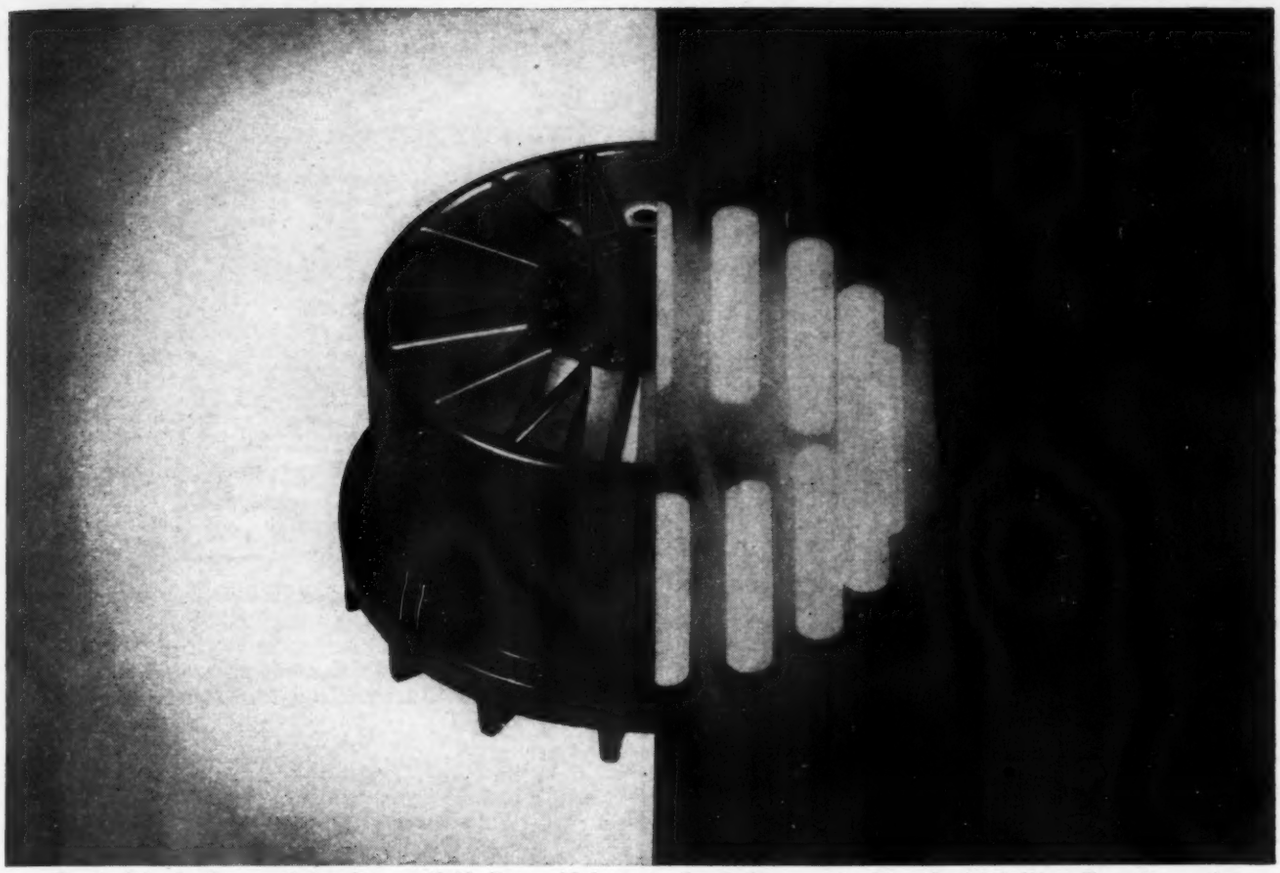
Similarly—for hundreds of tough jobs of power movement in industry today—you'll find T-J Air and Hydraulic Cylinders a real time-saver, muscle-saver and money-saver! Ideal for jobs where pushing, pulling or lifting is needed . . . 100 lb. or 50,000 lb. Available in many standard sizes and styles . . . both cushioned and non-cushioned types. Backed by 29 years' experience . . . precision-built for unbeatable performance! Write for latest catalogs. The Tomkins-Johnson Co., Jackson, Mich.

FOR TOUGH JOBS SPECIFY

TOMKINS-JOHNSON

RIVITORS . . AIR AND HYDRAULIC CYLINDERS . . CUTTERS . . CLINCHORS

T-J



Terminal ring for 40 mm. anti-aircraft gun molded by Raymond Laboratories, Inc. In this composite picture, the right half is an X-ray photograph showing the metal inserts.

IT'S TIME TO CHANGE YOUR IDEAS ABOUT PLASTIC MOLDING!

IF YOU are thinking about using plastics, the BAKELITE plastic part in the illustration may have a considerable bearing on your design and manufacturing problems. It is typical of many parts that were impossible or impractical to achieve in plastic molding until the heatronic molding technique was introduced by Bakelite Corporation in 1943. The part is extremely dense, weighing one-half pound. Note the wall thickness, which, in certain areas, is three-quarters of an inch. Note also the 16 long, slender metal inserts that are accurately positioned in the mold.

Heatronic molding uniformly generates heat within the molding material charge by means of high frequency current, after which the charge is transferred to standard compression and transfer molding equipment. But here are the outstanding accomplishments: curing time in the mold can be shortened by 1/10 to 1/2. Molding pressures can be reduced by 30 to 40 per cent. Considerably larger moldings can be produced on present presses and production per mold cavity can be stepped up greatly. Bulky, impact-resistant plastics can now be molded as readily as the general-purpose types. There are many other advantages including less wear on the molds and minimized shearing and displacement of inserts. The finish of the molded part is generally improved as are the mechanical and electrical properties.

Write Department 30 for further information on heatronic molding. Learn how to apply the benefits of this revolutionary technique to your current production.

BAKELITE PLASTICS

TRADE-MARK

TRADE-MARK

BAKELITE CORPORATION, *Unit of Union Carbide and Carbon Corporation* UCC 30 EAST 42ND STREET, NEW YORK 17, N.Y.

THAT's the best way to solve your steel supply problems quickly and efficiently. While our stocks today are not as complete as we would like them to be, we are making every effort to maintain balanced inventories to serve your needs better.

When you need steel, phone, write, or wire the nearest of our nine warehouses. If your order cannot be filled by one warehouse, it can often be filled quickly by another. All orders and inquiries receive courteous attention and prompt action.

U·S·S Stainless Steel available for immediate shipment!

Our warehouse stocks of U·S·S Stainless Steel include sheets, plates, bars of all kinds—rounds, squares, hexagons and angles—pipe, tubing, and welding electrodes in all standard grades and specifications.

War production has taught us new ways to use Stainless Steel. This increased knowledge is at your service. Our engineers will gladly assist in selecting the proper types of U·S·S Stainless Steel for your requirements and will help you with fabricating problems. And free technical bulletins will be sent to you upon request.

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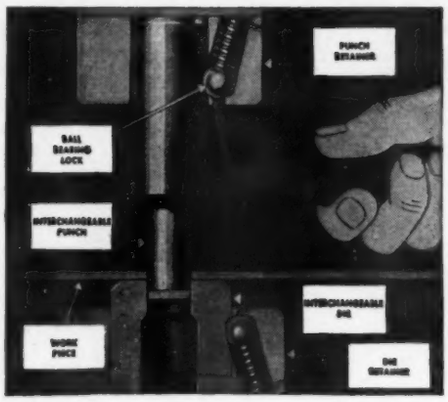

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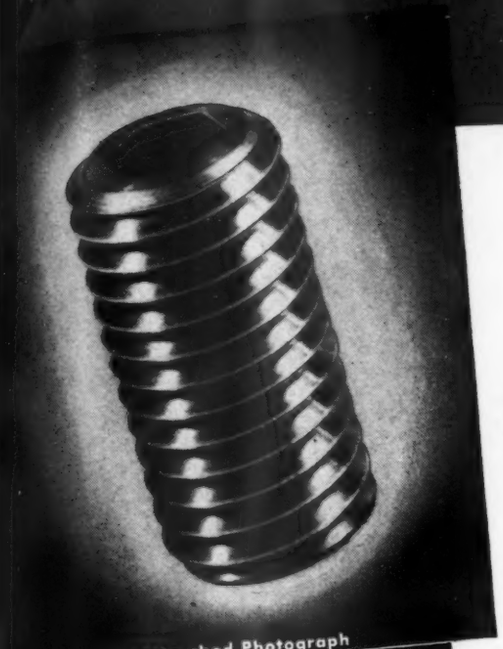
INDUSTRY ACCLAIMS THE NEW

Ground Threads · Size Mark · and Gear Grip

OFFERED IN SOCKET SCREWS BY **P-K**



Unretouched Photograph

The new P-K Ground Thread Socket Set Screws and Size-Marked Gear Grip Socket Head Cap Screws have been enthusiastically welcomed throughout industry. P-K has proved Socket Screws could be made better, and offered the improvements, not tomorrow, but *today*.

Ground Thread

SOCKET SET SCREWS

Thread Grinding – the process once employed only for making screws used in the finest precision equipment – has been adapted to quantity production of P-K Set Screws. Newly developed centerless thread grinding equipment forms the finished screws from hardened stock – with a mirror-smooth, bright appearance that is as different from tool-marred, cut thread set screws as day and night. Uniformly accurate, every screw checks to a dependable Class 3 fit.

Size-Marked

SOCKET HEAD CAP SCREWS

Marked clearly on the head of every P-K Cap Screw, the size can be seen at a glance. No need to guess and risk costly errors. No need to "mike" or gauge it. No time wasted sorting when screw sizes get mixed up. Speeds handling in assembly, and in the tool room.

Gear Grip*

ON SOCKET HEAD CAP SCREWS

The scientifically designed Gear Grip circles the head. Gives highly paid fingers a head start, makes driving surer, safer, – even in oil-slippery assemblies.

*U. S. Pat. No. 126,409

SEEING IS BELIEVING

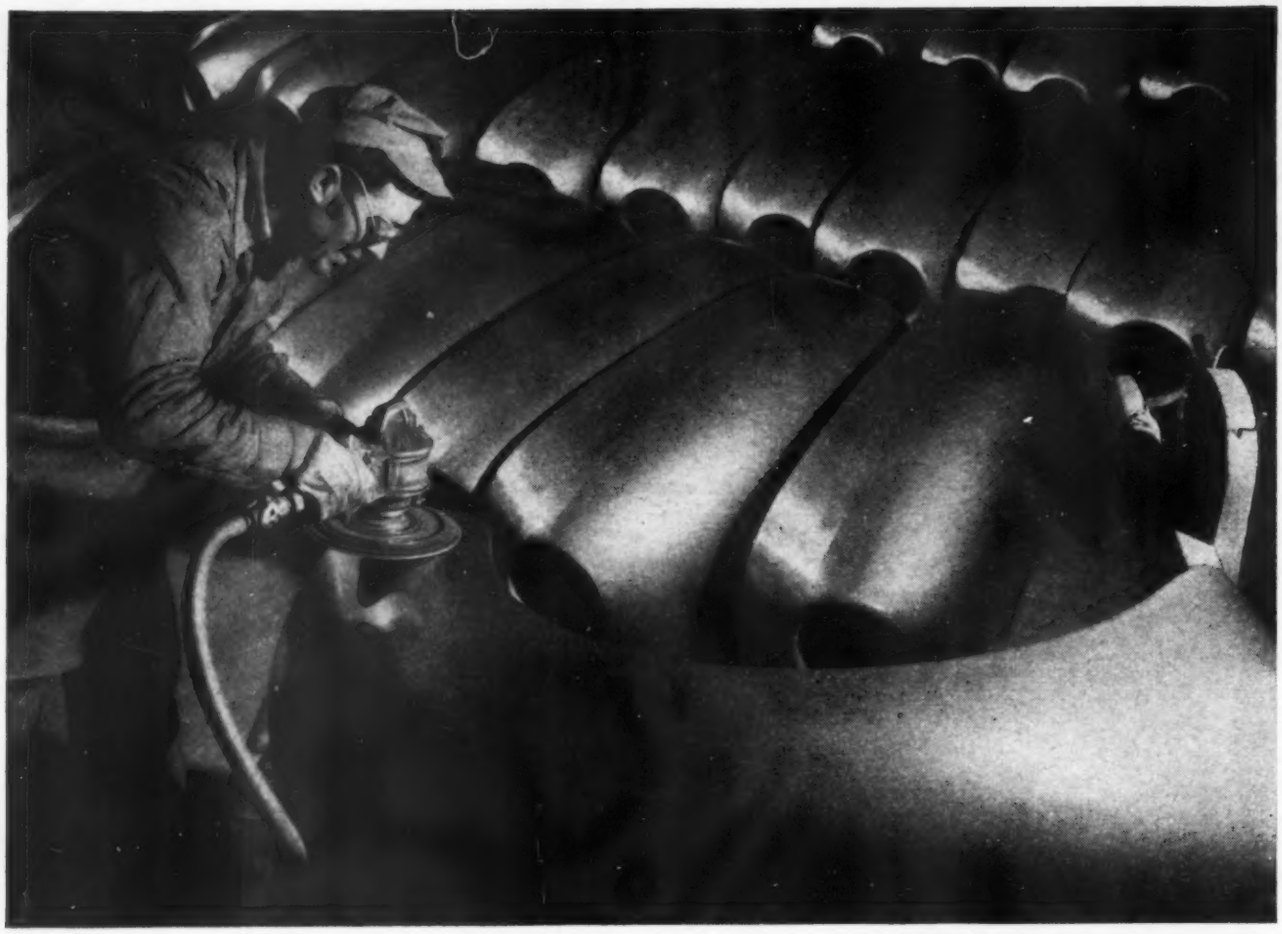
SEND FOR THE UNIQUE COMPARISON KIT OF SAMPLES. See for yourself the accuracy, finish and appearance of the new P-K Ground Thread Socket Set Screws. See how P-K Size-Marked Gear Grip Socket Head Cap Screws will save you time and trouble. You'll agree your assemblies deserve the many advantages of these 3 extraordinary P-K improvements. Write today! Parker-Kalon Corp., 194-196 Varick Street, New York 14, N. Y.

LIMITED RANGE OF SIZES NOW AVAILABLE

A complete range of sizes is being built up as rapidly as possible. Ask your Parker-Kalon Distributor if the sizes you need are available now. Meanwhile, write for samples.

SOLD ONLY THROUGH ACCREDITED P-K DISTRIBUTORS

PARKER-KALON *Cold-forged* SOCKET SCREWS



Making a piece of prosperity

THE workman in the picture above is finishing a fender.

He is making a good product, and he gets a fair wage for his labor.

He will spend his earnings for the products of other manufacturers, and so keep other people profitably employed.

In this way, he is making more than merchandise; he is making his contribution to the prosperity of the United States.

With this simple economic system . . . *keeping men and money at work* . . . America has grown great.

We believe it is a system that must be maintained, under conditions of free enterprise and free competition.

Here at Mullins we manufacture Youngstown Kitchens, porcelain enameled equipment and large steel stampings. By making the best products we can, and selling them at reasonable prices, we strive to keep our share of men and dollars profitably employed.

This is our contribution to continued prosperity. Every other manufacturer, whether he thinks of it or not, adds his share in a similar way.

If you believe this is a sound view of industry, you may be interested in a booklet we have distributed to our employees, "Not by Bread Alone." It discusses, in a simple way, some of our ideas about the true relationship between industry and general prosperity. Your request will bring a copy, and if you think it would interest your own employees, let us know.

MULLINS MANUFACTURING CORPORATION, Salem, Ohio

Mullins

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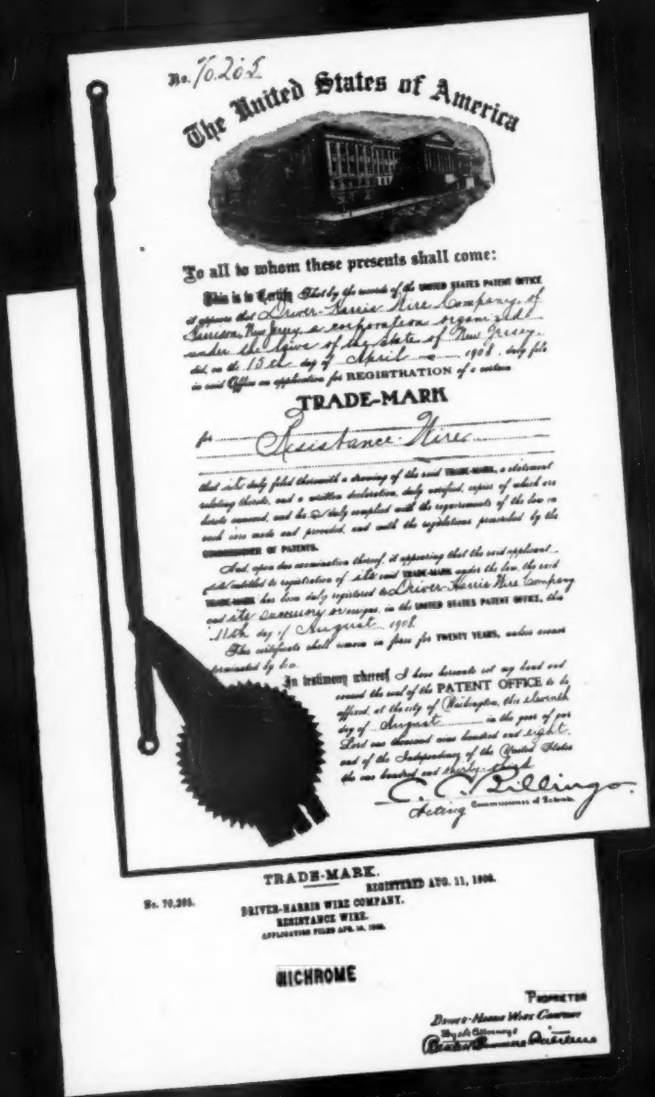
.....that Driver-Harris created

Nichrome*



No. 70,205.

The United States of America

To all to whom these presents shall come:

TRADE-MARK

for Resistance Wires

TRADE-MARK.

No. 70,205. REGISTERED AUG. 11, 1908.

DRIVER-HARRIS WIRE COMPANY.

RESISTANCE WIRE.

NICHROME

Down thru the ages the inscrutable countenance of Mona Lisa has been irrefutably attributed to and associated with Leonardo Da Vinci. Authenticated records prove conclusively that he was the creator of this masterpiece.

Likewise, the indisputable ownership of the trade-mark NICHROME for Resistance Wire was established by this duly authorized document granted to the Driver-Harris Company on August 11th, 1908. Subsequent registrations cover other product applications. Thus NICHROME is the registered trade-mark belonging solely and wholly to the Driver-Harris Company.

NICHROME is also the symbol of service that has for 38 years identified the *world's foremost heat and corrosion resistant alloy* – the time-tested standard by which other alloys are measured. Although there are other excellent nickel-chromium combinations there is only *one* NICHROME.....and it is made *only* by Driver-Harris.

*Nichrome is made only by

Driver-Harris COMPANY

HARRISON • NEW JERSEY

BRANCHES: Chicago • Detroit • Cleveland • Los Angeles • San Francisco • Seattle

*Trade Mark Reg U. S. Pat Off

ALLEN FLAT HEAD CAP SCREWS

set up *flush* in holding thin plates or superposed parts, without weakening the metal with deep countersink.

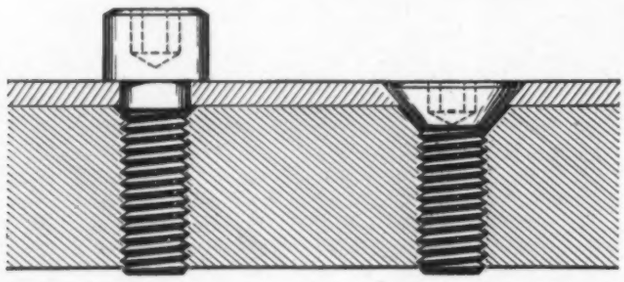
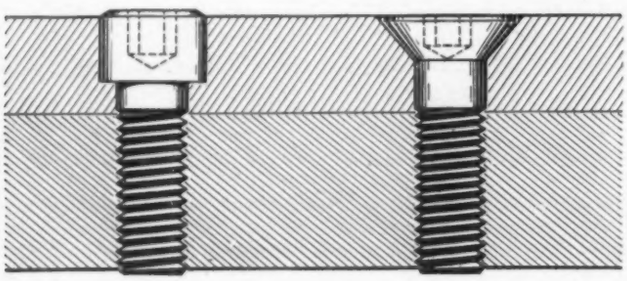


Figure 1, above, (right) shows flush surface achieved in tieing down metal piece thinner than head height of screw.

Figure 2, below, shows advantage in fastening relatively thin plate to retain flush surface without weakening the metal with deep countersink. Note more binding surface under head.



Here's the way to apply ALLEN holding-power to comparatively thin plates where a flush top surface must be achieved, with no gap between screw head and surrounding metal.

Note that top piece of metal in Figure 1 is thinner than head height of the Flat Head Cap Screw. There's more binding surface under the head than is the case with a projecting-head screw, and the angle helps lock the screw in place by drawing down on a conical surface.

Figure 2 shows application in a comparatively thicker plate. Here the flush surface is retained without weakening the metal with a deep countersink. Maximum strength in the screw itself is assured by "pressur-forming" of special-analysis ALLENOY steel.

Your local Allen Distributor will supply you with samples to try out these signal advantages of our Flat Head Cap Screws. Ask him or write us. Engineering data on request.

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Many component parts of post-war products can be made better, faster, cheaper—with
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Aluminum Alloy, Non-Heat-Treated—a perfected metal with proven superiority in a wide range of machining operations—an exclusive product of

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"Vibration nerves" are a chief cause of industrial fatigue, with all its attendant troubles: employees who are tired before lunchtime; supercritical foremen and quickly resentful workers; confusion; lowered production; increased absenteeism and labor turnover; all cutting deep into company profits.

An investment in Lord Engineered Vibration Control is an investment in improved morale of men as well as improved performance of machines. When you call in a Lord Engineer, you are calling on a generation of experience and research in the field of vibration control. Lord has a larger line of scientifically designed mountings and a larger library of experimental data and field studies, than all other companies combined.

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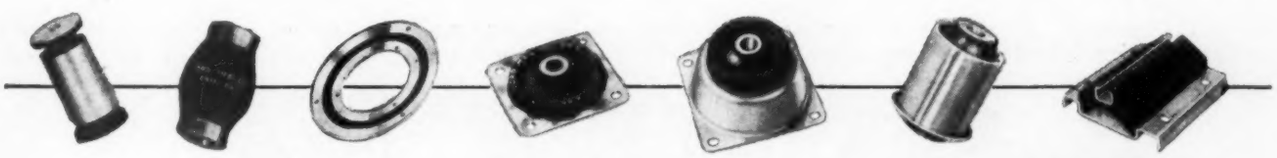
Bonded Rubber
MOUNTINGS

Every genuine Lord Mounting carries the name "LORD" embossed in the rubber or in raised letters on the forgings.



IT TAKES **BONDED RUBBER** *In Shear* TO ABSORB VIBRATION

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RAILWAY & POWER ENGINEERING CORP., LTD.
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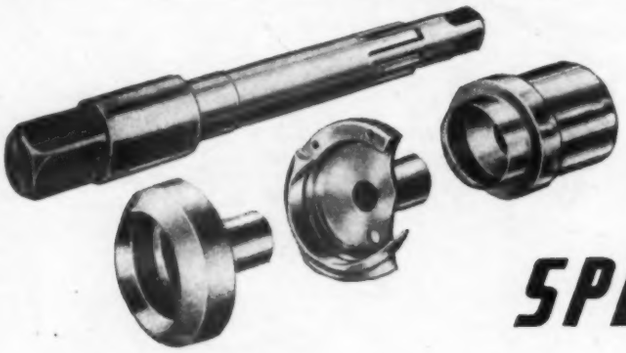
Originators of Shear Type Bonded Rubber Mountings

OH BOY! WHAT A BEAUTIFUL FINISH



..Yes, and all parts machined from SPEED CASE STEEL

Have a beautiful finish, too . . . Even with a machinability of 250 surface feet per minute SPEED CASE X1515 produces parts with exceptional finish and you get a tool life from 2 to 5 times longer than when cutting other CARBURIZING STEELS like X1020-X1314-X1315, etc.

➧ Write for our Brochure which gives complete data and Case Histories furnished by our customers.

Tear this off . . . ATTACH TO YOUR LETTERHEAD AND MAIL TO EITHER COMPANY BELOW

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YOUNGSTOWN, OHIO

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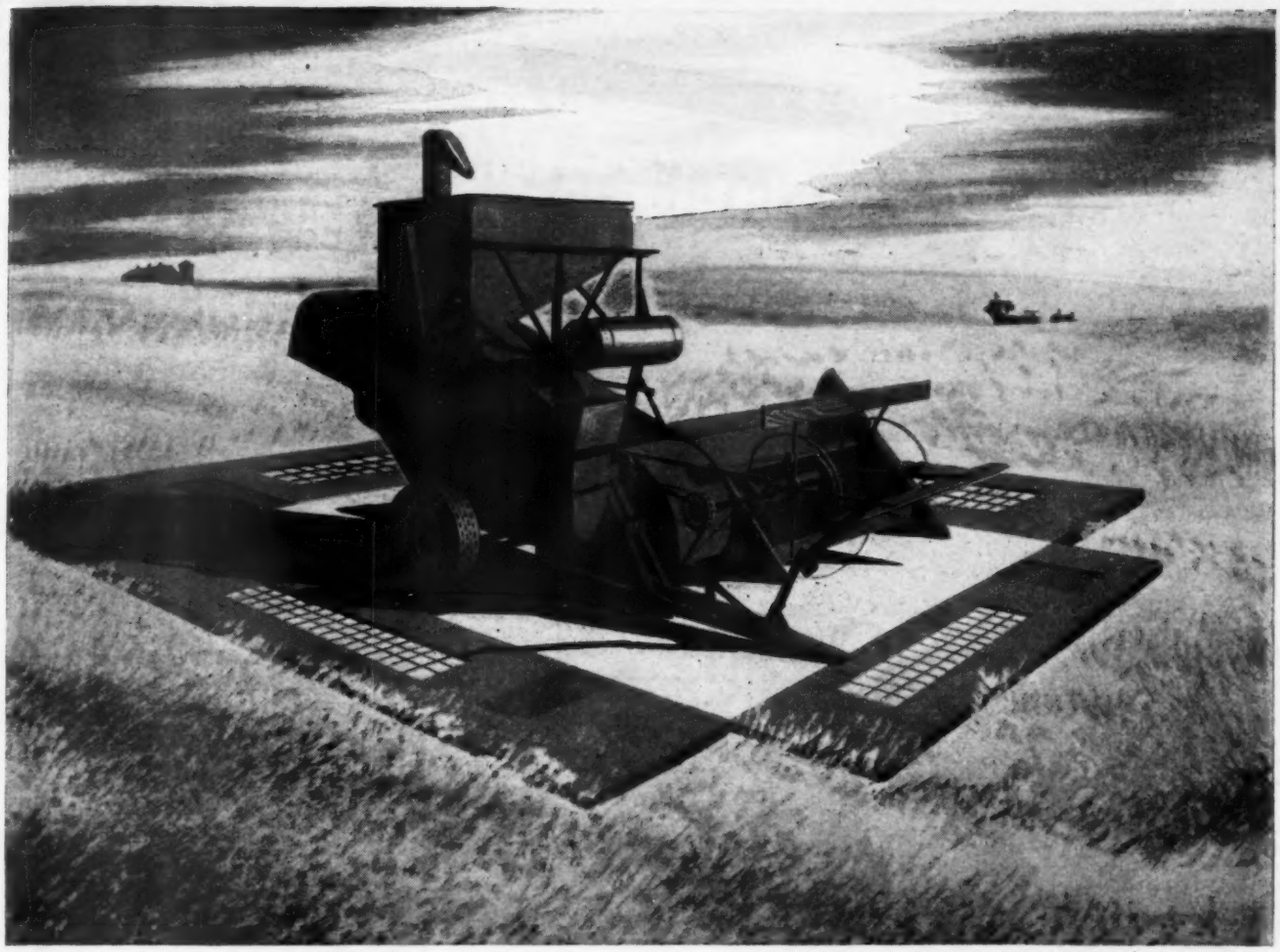


FACTORY IN THE FIELDS

TAKE away the brick walls from a manufacturing plant, throw in a dust storm and a cloudburst, shake vigorously and add a touch of frost and you've got a taste of what the maker of agricultural machinery is up against. He's working for farmers . . . and the factory is in the fields.

Machinery like that needs ball bearings to take abnormal loads and reduce friction. But that's asking ball bearings to take a lot of abuse. When a farmer's using machinery. . . that's the very time he can't stop to lubricate it. Nor can he afford any time out for shop repairs in town.

These three simple steps lock the **Wide Inner Ring Bearing** *to the shaft:*

1. 2. 3.

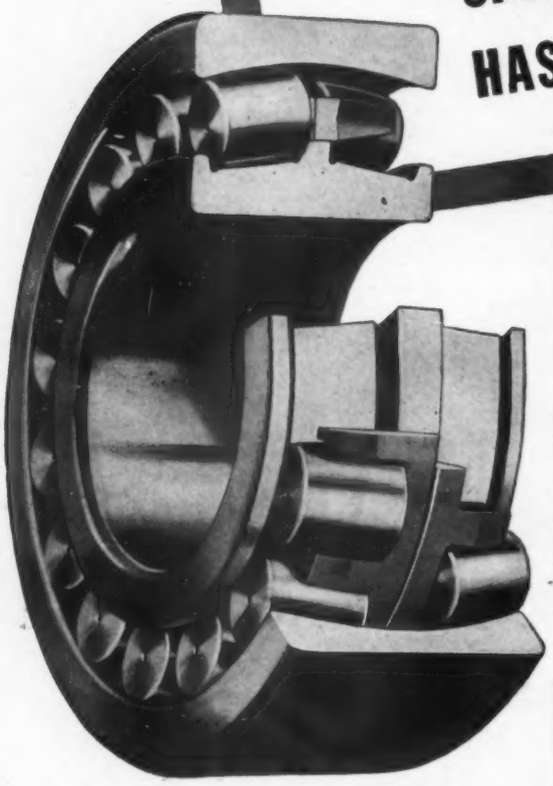
MOST COMPLETE LINE IN AMERICA

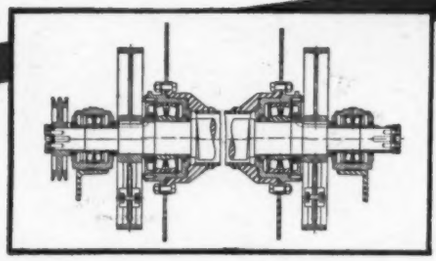
But Fafnir has a ball bearing that can take all that. It's the wide inner ring ball bearing with exclusive self-locking collar and Mechani-Seals. The wider ring affords added shaft support. The self-locking collar enables the farmer to remove and replace, if necessary, this Fafnir Bearing with ease. And the Mechani-Seal, a labyrinth of steel plates, absolutely traps in grease and locks out dust, dirt and moisture. It's a bearing a farmer can respect. It's part of the reason American farm equipment is the world's finest

And it's anothe: illustration of how Fafnir works from the bearing need to the precise bearing for that need . . . of how the Fafnir line became "the most complete line in America." The Fafnir Bearing Co., New Britain, Connecticut.

FAFNIR BALL BEARINGS

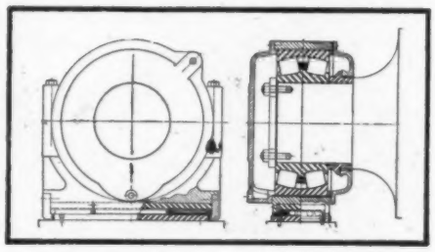
TORRINGTON SELF-ALIGNING SPHERICAL ROLLER BEARING HAS MANY APPLICATIONS





CONSTRUCTION... This X-section drawing shows a mounting of four Torrington Self-Aligning Spherical Roller Bearings on the main eccentric shaft of a shaker screen. The self-aligning feature of the bearings easily compensates for distortion and satisfactorily handles heavy shock loads.

PAPER... Shown here in X-section is a Torrington Self-Aligning Spherical Roller Bearing as applied to a paper calender bottom roll, with a ladder bearing utilized under the floating housing to permit it to move freely when the roll expands or contracts.

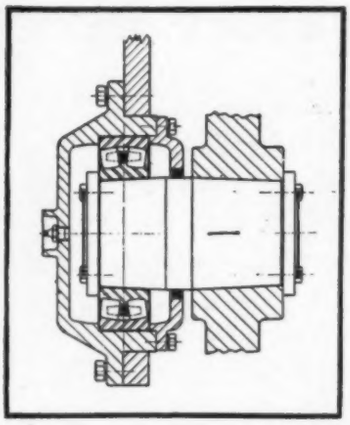


Of major importance to design engineers and users of machinery in which friction poses a serious problem is the versatility of the Torrington Self-Aligning Spherical Roller Bearing . . . .

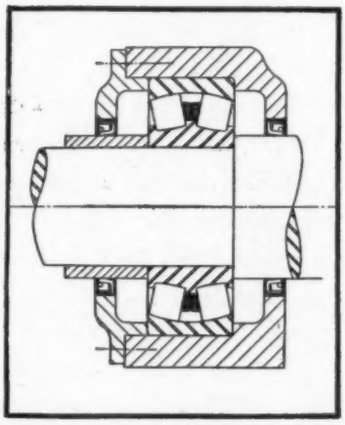
★

The engineering staff of Torrington's Bantam Bearings Division is prepared to offer you practical, cost-saving suggestions for adapting the high-capacity Self-Aligning Spherical Roller Bearing to the machines you design, build or operate. For further information write for our Bulletin No. 100A or contact your nearest Torrington Representative.

THE TORRINGTON COMPANY
BANTAM BEARINGS DIVISION
SOUTH BEND 21, INDIANA



OIL... The accompanying drawing illustrates a wrist pin application of the Torrington Self-Aligning Spherical Roller Bearing as used for oil field pumping units. Distortion in the pitman does not affect the efficient functioning of the bearing in this mounting.



STEEL...X-Section drawing shows a typical arrangement for the Torrington Self-Aligning Spherical Roller Bearing in modern, high speed auxiliary equipment for steel mills. Temperature changes, misalignment and high load stresses do not affect the free-rolling action within the bearing.

TORRINGTON BEARINGS

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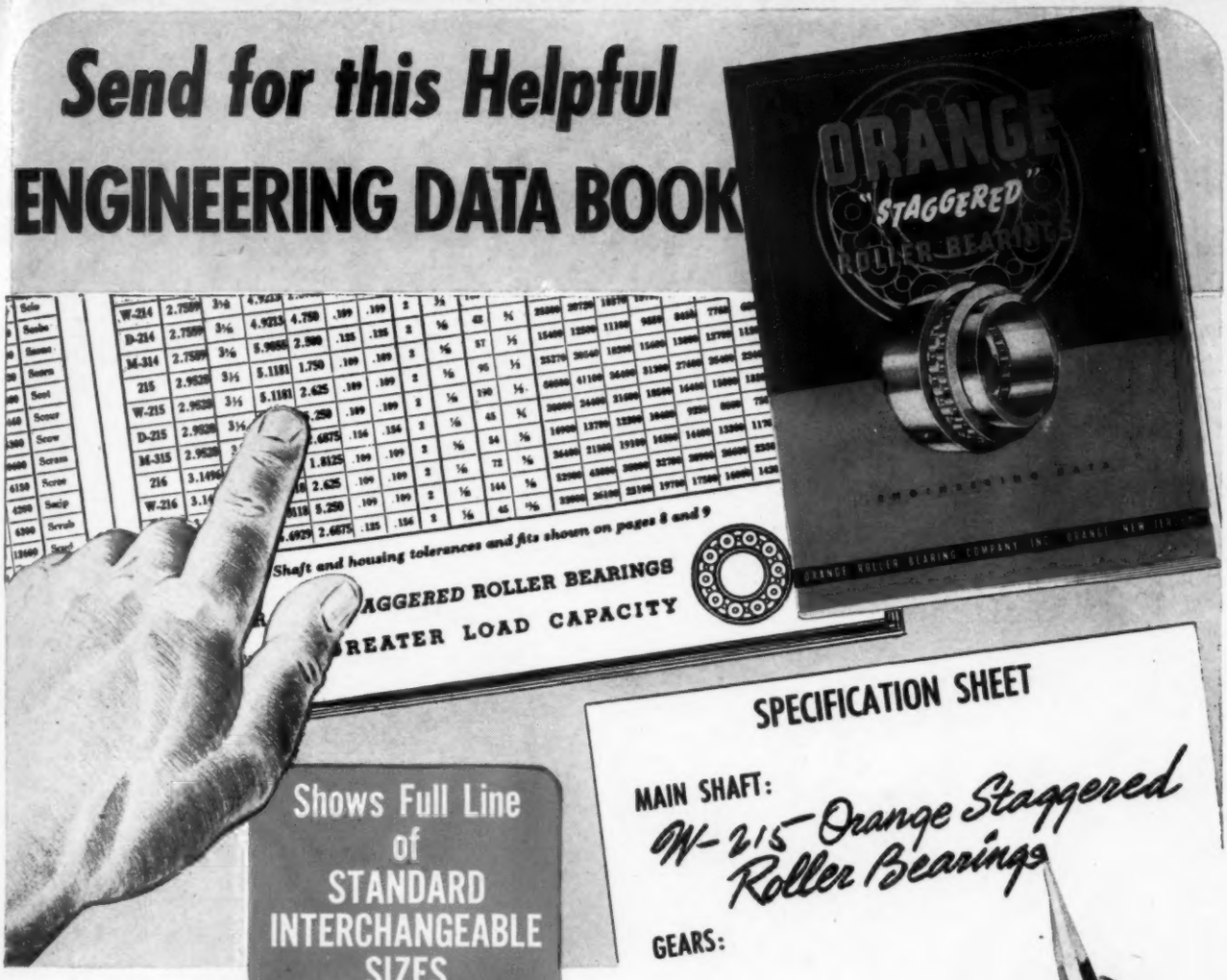

Shows Full Line of STANDARD INTERCHANGEABLE SIZES

You'll find the answer to heavy duty bearing installations by consulting the Engineering Data Book on Orange Staggered Roller Bearings. This Data Book is built for designing engineers—gives all dimensions, capacities and tolerances in simplified form, set in large, easy-to-read type—shows many typical applications. It explains in detail the exclusive Staggered Roller design, which distributes the load over many small rolls instead of a few large rolls, giving Orange Staggered Roller Bearings greater load-carrying capacity and smoother running than conventional types. Study these advantages before specifying bearings for post-war products.

ORANGE "STAGGERED" ROLLER BEARINGS

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Please send me a copy of the Staggered Roller Bearing Data Book.

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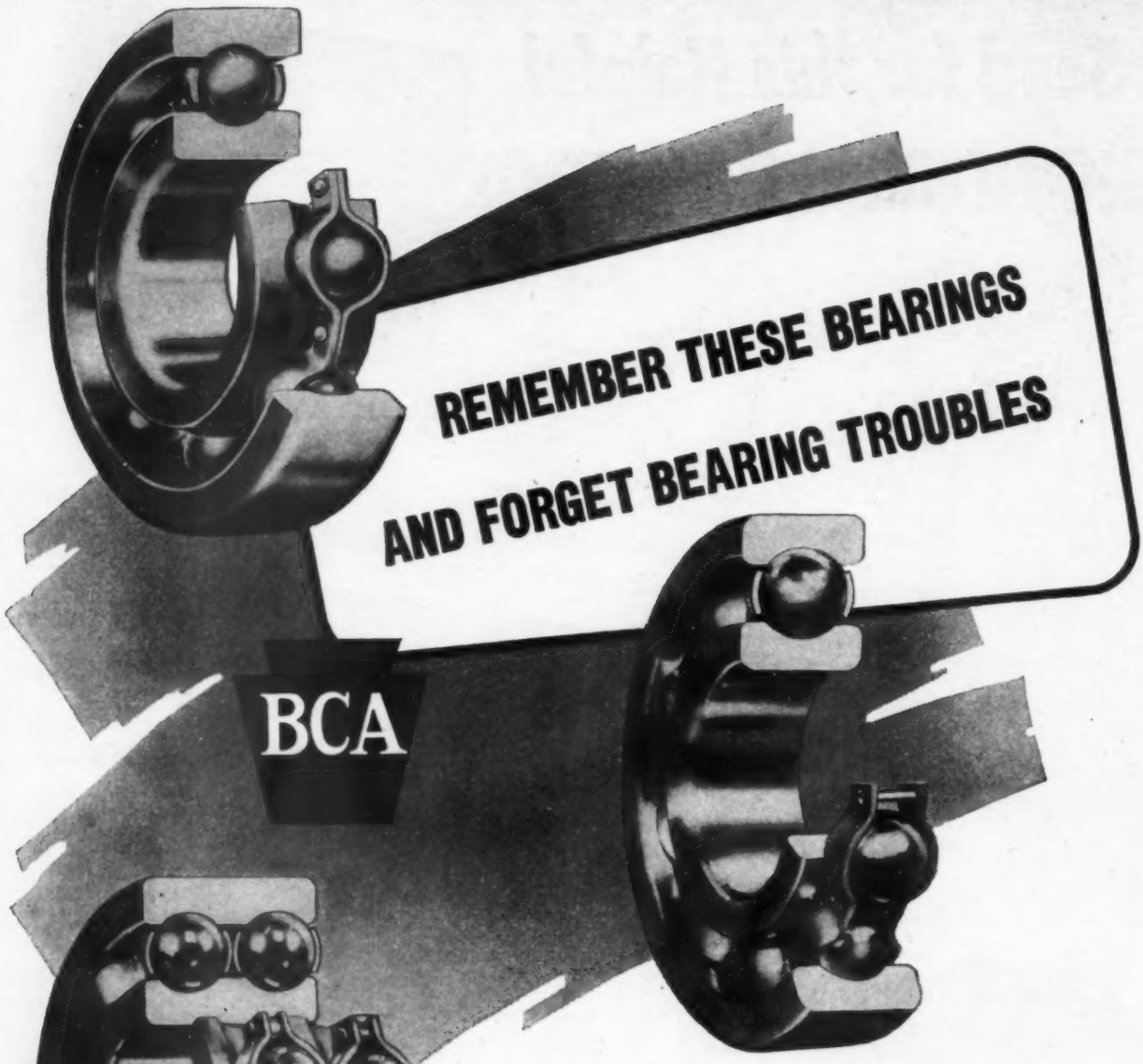
Title..... .....

A.M Company..... City..... State.....



EVERY BCA BALL BEARING . . . radial . . . thrust . . . angular contact . . . is accurately engineered to meet the conditions of load . . . shock . . . thrust and service for which it is designed. That's why they stay out of trouble . . . require minimum maintenance.

BCA Ball Bearings help machines meet production schedules by helping to prevent machine breakdowns . . . lower production costs by reducing bearing maintenance. BCA's are designed to accurate tolerances . . . engineered with generous marginal allowances. BCA engineers will be glad to review your designs or to suggest the right bearings for your applications.

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BALL BEARINGS

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New Catalogs, Booklets, Bulletins

METAL-WORKING EQUIPMENT

1 HOLE PUNCHING UNITS—Wales-Strippit Corp., North Tonawanda, N. Y. 40-page Catalog BL describes and illustrates hole punching units for sheet metal up to ⅛ inch thick. Mounting methods and general information on setups given for T-slotted plates and mounting plates.

2 DRILL ATTACHMENTS—George A. Terry Co., Buffalo, N. Y. 30-page Catalog No. 45 shows various types of angle and flexible drill attachments. Examples of hard-to-reach drilling jobs illustrate wide use of attachments.

3 SHAVING MACHINE — National Broach & Machine Co., Detroit, Mich. 8-page Bulletin No. RS45-11 "Roto Shaving Does A Better Job Faster" lists advantages of shaving and illustrates different types of Red Ring shaving machines and methods of mounting the cutters and applying them.

4 INVOLUTE SPLINES — National Broach & Machine Co., Detroit, Mich. 12-page Bulletin SP45-11 "Involute Splines For Modern Production" discusses advantages of involute spline and manufacturing by broaching and shaving.

5 DIE-FILING MACHINE—All American Tool & Mfg. Co., Chicago, Ill. 4-page Bulletin 115 describes and illustrates precision die-filing machine and universal-joint file clamp. Method of setting file square and use of machine for sawing and honing discussed.

6 DIE-CASTING MACHINES — Hydraulic Press Mfg. Co., Mount Gilead, Ohio. 8-page Bulletin No. 4402 "All Hydraulic Die Casting Machines for Magnesium, Aluminum, Copper and Zinc Alloys" describes machines fully and has special section on construction of H-P-M hydro-power radial pump.

7 POWER PRESS—General Manufacturing Co., Detroit, Mich. 4-page Bulletin No. 181 describes flexible power press and use in straightening, assembling, staking, forcing, bending, burnishing, riveting, push broaching, pressing on gears, pressing shafts into armatures, and similar operations.

8 TIME RECORDER — The Bristol Co., Waterbury, Conn. 6-page Bulletin OP1502 describes and illustrates running-time recorder for recording operating time of machine tools, presses and similar equipment.

9 SCREW-MACHINE TUBES — Corlett-Turner Co., Chicago, Ill. 4-page folder on silent stock tubes for screw machines and turret lathes with complete description of use and advantages in reducing noise in screw-machine departments.

10 FORGING EQUIPMENT — Kropp Forge Co., Chicago, Ill. 52-page booklet discusses advantages of forged parts and equipment necessary to control quality. Making of flat die, drop, and upset forgings and their heat treatment, finishing, and testing are illustrated and explained.

TOOLS AND ACCESSORIES

11 TOOLS—Lake Shore Tool Works, Inc., Chicago, Ill. 116-page catalog "Lake Shore Tools—High Speed and Carbide" lists its line of milling cutters, hobs, gear cutters, broaches, carbide-tipped tools, reamers, counterbores, countersinks, and other tools.

12 CARBIDE TOOLS — Kennametal Inc., Latrobe, Pa. 56-page catalog 45 gives complete line of cemented-carbide tools, including turning, boring and facing tools, lathe centers, files, milling cutters and tools for special applications. Selection of tools, chip breakers, furnace and torch brazing of tips, grinding, proper use and tool wear analysis are discussed in detail.

13 HAND TOOLS—Standard Pressed Steel Co., Jenkintown, Pa. 4-page folder describes the Hallowell Unbrako key kit for driving socket set and cap, Phillips, and slotted head screws. Uses of tool are illustrated and data given on sizes of screws that bits will accommodate. Folder is handy guide to users of key kits and will insure their full utilization.

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14 GAGE BLOCKS—George Scherr Co., New York, N. Y. 4-page folder 111 on gage block utility set shows examples of its use for making accurate measurements as snap gage, height gage and caliper.

15 PRECISION GAGE — Sheffield Corp., Dayton, Ohio. 32-page Bulletin No. 600-1-45 "Universal Precisionaire" describes and illustrates use of Precisionaire for general gaging purposes. Various attachments to adapt gage to wide variety of work are shown.

16 UNIVERSAL TESTER—W. C. Dillon & Co., Inc., Chicago, Ill. 8-page Bulletin No. 142 on "Dillon Universal Tester" shows application in compression and transverse testing of springs, woods, plastics, spot-weld and riveted specimens, wire rope and other materials.

17 OPTICAL GAGE—The Compar-Instrument Co., Detroit, Mich. 4-page folder on the Comparoscope describes the machine and explains mechanics of its operations in measuring surface finish.

18 SURFACE COMPARATOR—The Comtor Co., Waltham, Mass. 4-page Bulletin No. 32 "Quick-Scanning Surface Comparator" describes and illustrates Comtor comparator and use in comparing surface finish of part with standard finish.

19 TORQUE WRENCHES — JO Manufacturing Co., South Gate, Calif. Catalog on JO line torque wrenches gives specifications of tools and illustrates production, inspection servicing operations for plastics and metals.

20 MAGNETIC CHUCKS—Hanchett Mfg. Co., Big Rapids, Mich. 18-page Bulletin D45-1 on Hermeti-Coil magnetic chucks shows their application to wide variety of work in grinding, boring, milling, planing and shaping.

HEAT-TREATING AND WELDING

21 INDUCTION-HEATING UNITS—Lepel High Frequency Laboratories, Inc., New York, N. Y. 32-page catalog on induction-heating equipment explains principles of induction heating and application to heat-treating, brazing, soldering and melting.

22 CONTROLLED - ATMOSPHERE FURNACES—Lindberg Engineering Co., Chicago, Ill. 12-page Bulletin 190 on Hydrizing describes application to hardening, brazing, bright annealing and bright tempering. Explains operation of Hyco, Hyen, Hyer and Hyam controlled-atmosphere generators and gives chemical compositions and cost.

23 INDUCTION HEATING — Budd Wheel Co., Detroit, Mich. 24-page booklet "Induction Heating" illustrates application of induction heating to internal diameters in heat-treating. Describes induction heating and advantages in forging, and equipment offered for billets, bars and tubes.

24 ELECTRONIC INDUCTION HEATING—Illinois Tool Works, Electronics Division, Chicago, Ill. 4-page folder Form 437 describes the Illitron electronic induction-heating unit for surface hardening, brazing, soldering, and other operations.

25 CURRENT CONTROLLER—Automatic Temperature Control Co., Inc., Philadelphia, Pa. 4-page Bulletin T-50 on electronic balancer input controller for electric furnace. Principle and method of operation, applications and advantages described.

26 RADIANT-TUBE HEATING — Surface Combustion Corp., Toledo, Ohio. 4-page Bulletin SC128 covers application of radiant tubes to various types of heat-treatments and processes, describes advantages when applied to carburizing, carbon restoration, hardening and annealing.

27 CUTTING CAST IRON—National Cylinder Gas Co., Chicago, Ill. Circular N-606 describes in detail cutting of cast iron with oxyacetylene. Discusses proper types of equipment, preheating conditions, cutting positions, oxygen and acetylene pressures.

28 ARC-WELDING ELECTRODES—Wilson Welder & Metals Co., New York, N. Y. 32-page catalog supplies complete data on proper electrodes for all types of work on wide variety of metals. Describes welding procedures, chemical analysis, specifications, and other engineering data.

29 PHOSPHOR - BRONZE ELECTRODES—Eccles & Davies Machinery Co., Los Angeles, Calif. 16-page folder "Edco Electrodes" gives physical and chemical properties of phosphor-bronze electrodes, polarity table, and welding procedure for copper, bronze, cast iron and steel.

30 BRONZE ELECTRODES—Metal & Thermit Corp., New York, N. Y. 8-page folder "Murex Coated Bronze Electrodes" discusses coated phosphor- and aluminum-bronze electrodes of various types, applications, identification, chemical and physical properties of deposited metal.

31 ALLOY WELDING WALL CHART—Arcos Corp., Philadelphia, Pa. Large reference chart on alloy welding provides quickly information on chemical analysis of deposited metal from Arcos electrodes, corrosion resistance, ferritic electrodes for special purposes, alloy electrodes for surfacing, heat treating, electrode identification, current and voltage.

32 CORROSION-RESISTANT FACING—Haynes Stellite Co., Kokomo, Ind. 4-page folder "Hastelloy Facing For Corrosion Resistance" describes four types of alloys and particular uses. Shows methods of application by oxyacetylene, atomic hydrogen and electric-arc welding for small areas and by attaching large sheets by plug, strip, resistance or lap welding for large areas.

33 WELDING METHODS—Air Reduction Sales Co., Inc., New York, N. Y. 32-page booklet "New and Improved Oxyacetylene Methods for Steel Foundries" demonstrates advantages of machine flame cutting for removing gates and risers, flame scarfing, gouging, descaling, hardening and lancing.

34 WELDING ACCESSORIES—Hobart Brothers Co., Troy, Ohio. 8-page folder DM-709 covers arc-welding accessories, including protective clothing, electrode holders, brushes and face shields.

35 WELDED PRODUCTS—Youngstown Welding & Engineering Co., Youngstown, Ohio. 16-page booklet lists welded products including pickling and heat-treating equipment. Describes Weldco steam jet for heating and agitating of pickling tanks and reclaiming of rolls by pressure welding.

PLANT SERVICE EQUIPMENT

36 AIR HEATERS—Gas Appliance Service Inc., Chicago, Ill. 4-page folder "Rapidry Air Heaters for Industrial Ovens and Dryers" describes direct fired, convection air heater for drying, core baking, stress relieving.

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when you ROTO-FINISH parts mechanically!

Finish and color parts with Roto-Finish and you have accurate control to obtain the desired type of surface. You'll get this finish on one or a thousand loads and the results will be the same with one run or many. The Roto-Finish mechanical process of controlled action of chips, compounds and parts is a precision method that enables you to predetermine the exact type of finish required on parts of aluminum, brass, magnesium, steel, stainless steels, and die cast alloys.

Add this feature of control to those of economy and speed and you can see why Roto-Finishing parts is the modern production method. Economy is governed by the huge savings in man hours plus savings in subsequent plating operations. Roto-Finish speeds up production by processing quantities of parts mechanically.

Take advantage of our offer to process your parts and furnish complete information. No obligation. THE STURGIS PRODUCTS CO., 604 Jacobs Street, Sturgis, Michigan.

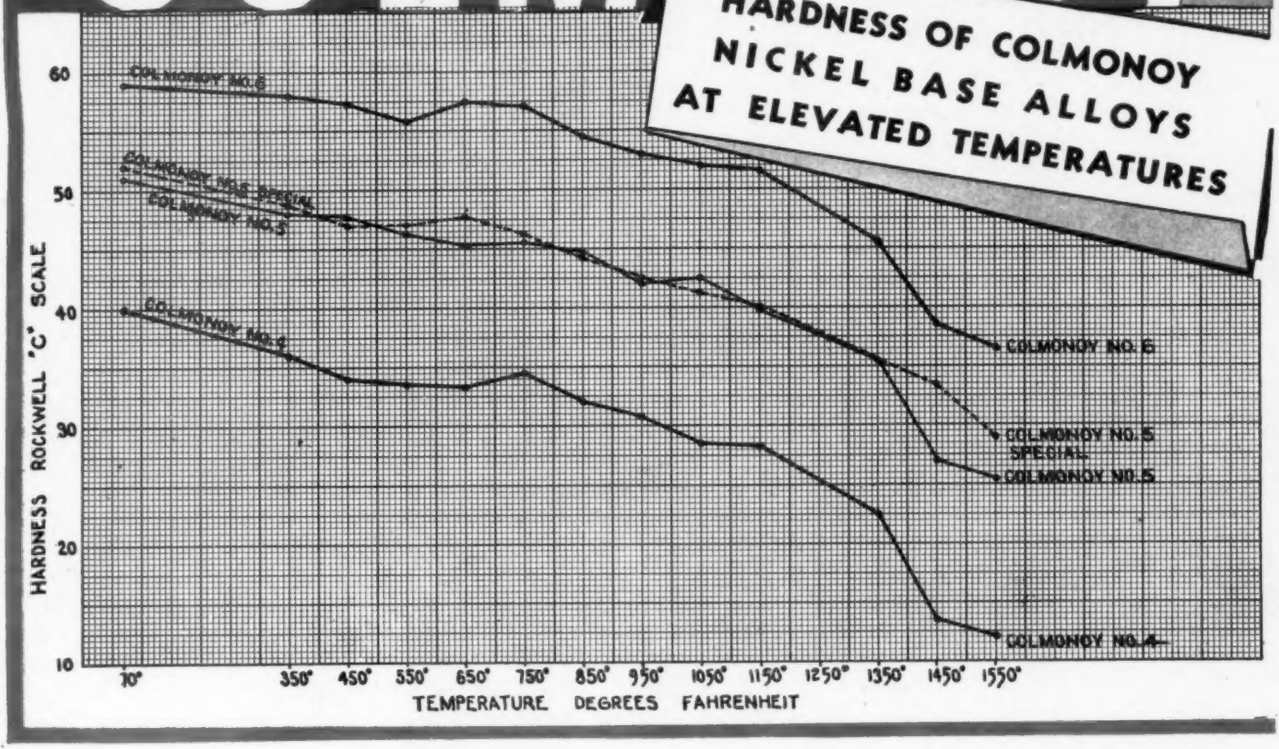
ADD YOUR NAME TO THIS LIST OF PROMINENT ROTO-FINISH USERS

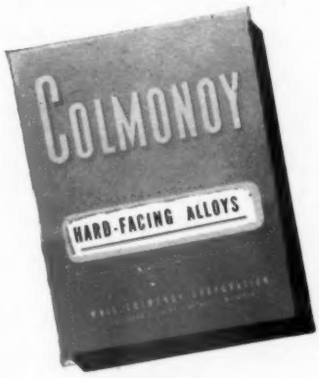
Argus Camera Co., Ann Arbor, Michigan.
Aro Equipment Co., Bryan, Ohio.
Cutler-Hammer, Inc., Milwaukee, Wisconsin.
Doehler-Jarvis Corporation, Grand Rapids, Mich.
Edison Gen. Elec. Appliance Co., Inc., Chicago, Ill.
Electric Auto-Light Co., Woodstock, Illinois.
Farnsworth Television & Radio Corp., Marion, Ind.
International Business Machines, Endicott, N. Y.
Jones & Lamson Machine Co., Springfield, Vermont.
Timken-Detroit Axle Co., Detroit, Michigan.

ROTO FINISH

THE UNIFORM MECHANICAL PROCESS—
FOR GRINDING • DE-BURRING • POLISHING • HONING • COLORING

COLMONOY





Write for Catalog

Covers all Colmonoy Nickel and Ferrous Base Alloys.

THE chart above answers the question asked by many engineers—"How hard is Colmonoy at high temperatures?" Any hard facing alloy that loses its hardness too rapidly at the temperatures at which it must operate, is ineffective. Check the Colmonoy Nickel Base Alloys on the chart. You will see why they are the most efficient hard facing alloys to use on such applications as hot oil pumps, steam valves, glass working operations, high temperature chemical processing, hot forming dies, kiln applications—and others requiring resistance to the abrasion and corrosion usually associated with high temperature operations. Engineering service available at all branch offices.

WALL COLMONOY CORPORATION

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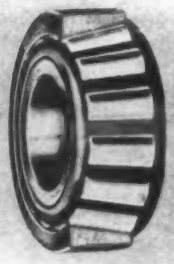
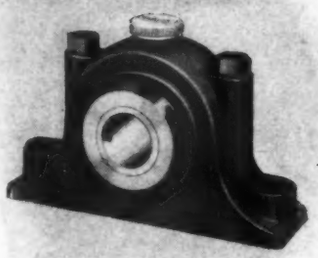
DODGE PUTS TIMKEN BEARING PRECISION INTO WORKING CLOTHES





Delivered fully assembled, adjusted, lubricated, the Dodge-Timken Double Interlock Pillow Block is ready to lock on the shaft, run at full speed and full load. Dodge mounts, seals and houses the bearing assembly, with its double row of precision-finished rollers—makes it available for immediate service, with no assembling required on the job.

From our foundry, through many precision operations, on the latest machine tool equipment, the parts required for mounting this bearing are manufactured complete in the Dodge factory. This is one of the famous Dodge 30,000 hour line, covering a wide range of industrial bearing requirements, and promptly available from distributors' stocks.

Look for the Dodge distributor in your classified telephone directory under "Power Transmission Equipment."

DODGE MANUFACTURING CORPORATION, MISHAWAKA, INDIANA

Dodge-Timken Double-Interlock Bearing

LUBRICATION COVER CAP KEEPS DIRT OUT
STURDY, SELF-ALIGNING OUTER HOUSING
INNER HOUSING SELF-ALIGNS WITH SHAFT
NON-RUBBING INDESTRUCTIBLE LABYRINTH SEALS
SNAP RING AND SHIMS MAINTAIN CORRECT BEARING ADJUSTMENT
SET SCREWS LOCK BOTH ENDS OF RACE TO SHAFT
BEARING DELIVERED COMPLETELY ASSEMBLED, ADJUSTED, LUBRICATED—READY TO SLIP ON SHAFT AND GO TO WORK.

THE SYMBOL THAT CAME TO LIFE

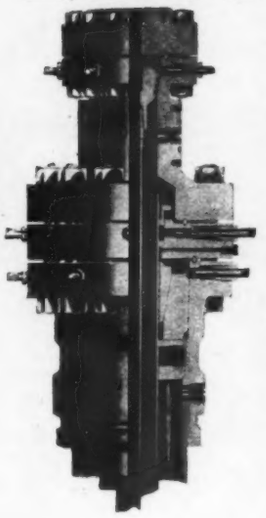
257 factory graduate Transmissioneers wear this sign of a nation-wide personal service that provides the latest answers to power transmission problems.

DODGE
MISHAWAKA

Copyright, 1946, Dodge Mfg. Corp.

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, ETCHING COMPANY OF AMERICA, 1520 MONTANA STREET, CHICAGO 14, ILLINOIS

SPEED CASE Plate
Cuts "CHRISTMAS TREE" Costs



The Christmas tree pictured is a familiar item to oil men — though it is not the kind you recently decorated, nor yet the type found on submarines.

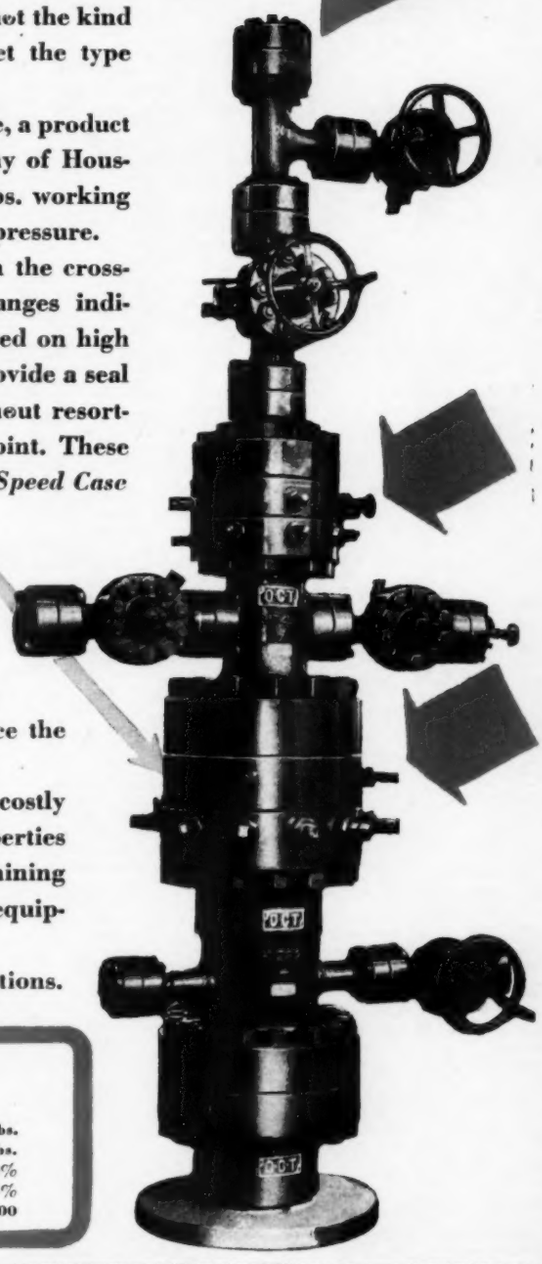
This assembled Christmas tree, a product of the Oil Center Tool Company of Houston, Texas, is built for 7,500 lbs. working pressure and 15,000 lbs. test pressure.

The construction is shown in the cross-section view. The auxiliary flanges indicated by the arrows are employed on high pressure well completions to provide a seal between the casing strings, without resorting to a welded seal at that point. These flanges present very definite evidence of the qualities of *Speed Case* plate, from which they are made.

Despite the ready machinability of *Speed Case* plate, it has excellent physical properties which enable it to easily withstand the working pressure of 7,500 lbs. p.s.i. Using *Speed Case* plate eliminates the danger of checking, cracking or blowing out. Moreover, the savings in machining time effected by the use of *Speed Case* reduce the cost of the flanges quite substantially.

Speed Case can be profitably used in place of more costly steels for numerous parts for which its high physical properties are fully adequate, and where its incomparable machining qualities reduce finishing costs and prolong machine and equipment life.

Send for Catalog 1243, which shows numerous applications.



Physical Properties of *Speed Case* Plate

(1" thick hot rolled plate, machined to .505" specimen)

Yield Point P.S.I.	45,000 lbs.
Tensile Strength P.S.I.	70,000 lbs.
% Elongation in 2"	30%
% Reduction of Area	54%
Machinability — S.F.P.M.	220-300

W. J. HOLLIDAY & CO.

"Established 1856"

Speed Case-Speed Treat Plate Division, Hammond, Indiana

Plants: Hammond and Indianapolis, Indiana

Quality Controlled Speed Case and Speed Treat Steel Is Available In All Common Plate Sizes from these Distributors

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The Burger Iron Company, Akron, Ohio
Grammer, Dempsey & Hudson, Inc., Newark, New Jersey
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Peckover's Limited, 77 Front Street, E. Toronto, Ont., Canada
Earle M. Jorgensen Co., 5311 Clinton Drive, Houston
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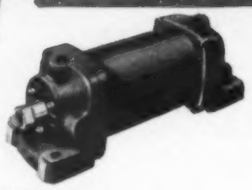
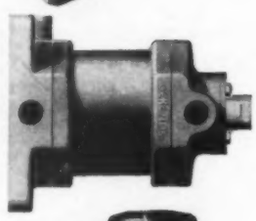
GEROTOR

Serves You With a . . . COMPLETE Line for Your

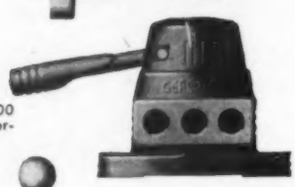
AIR AND HYDRAULIC SYSTEMS



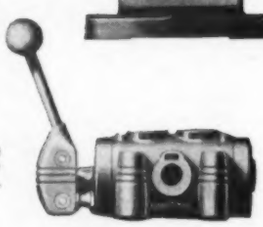
Gerotor Model 111 Foot Mounted double-acting, non-rotating Air Cylinder



Gerotor Model 241 Blind End Flange Mounted, double-acting Hydraulic Cylinder.



Gerotor Model 2100 Four Way Hand operated Air Valve.



Gerotor Model 5100 hand operated Four Way Hydraulic Valve.

Gerotor Series "H" single unit, plain mounting Hydraulic Pump.

Gerotor Model 9100 Hydraulic Pump Unit.

AIR CYLINDERS

Designed for 150 P.S.I. air and 300 P.S.I. oil or water service. Double-acting, non-rotating type offered in 7 mounting styles, twelve bore diameters, any length stroke, and with cushioning feature. Special models supplied. Rotating type of aluminum alloy body available for 3600 R.P.M. service.

HYDRAULIC CYLINDERS

Designed for 750 P.S.I., 1500 P.S.I., and 3000 P.S.I. oil or water service. Double-acting type available in 7 mounting styles, ten bore diameters, any length stroke, and with cushioning feature. Special models supplied. Rotating cylinders available for 500 P.S.I. oil service.

AIR VALVES

Designed for pressures up to 150 P.S.I. in 5 types of operation: hand, foot, cam, solenoid, and remote. 5 sizes available: ¼", ⅜", ½", ¾" and 1". Special models supplied to your special order.

HYDRAULIC VALVES

Designed for pressures up to 1500 P.S.I. in 6 types of operation: hand, foot, cam, solenoid, oil pressure, and air pressure operated. 7 sizes available: ¼", ⅜", ½", ¾", 1", 1-¼" and 1-½". 5 piston designs for any hydraulic circuit. Special models supplied.

HYDRAULIC PUMPS

Single pumps for oil service are available in 3 series, with capacities from .4 G.P.M. to 40 G.P.M. and more, up to 1000 P.S.I. Double pumps available in 4 series covering wide range of delivery and pressure combinations. All pumps can be had with plain, base, or flange mounting.

HYDRAULIC PUMP UNITS

Available in 5 tank sizes, with oil pump capacities from .4 G.P.M. to 40 G.P.M. and more, at pressures up to 1000 P.S.I.

"GRIP TUBE" FITTINGS

Seal higher fluid pressures and absorb excessive vibrations. Available in variety of styles for every installation need.

WORK HOLDING DEVICES

Precision built, quick-acting mandrels and collet chucks increase production speeds and minimize operator fatigue. Air and hydraulic operated.

GEROTOR MAY CORPORATION
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YOU WILL SEE THE COMPLETE GEROTOR LINE AT BOOTH 1422
ASTE NEW ERA EXPOSITION, APRIL 8 TO 12, CLEVELAND, OHIO

How Up-To-Date are you on ALUMINUM?

Flies and streamers, courtesy Abercrombie & Fitch Company, New York.

WHICH FLY FOR THE CAST?

PARMACHENE BELLE, Royal Coachman, Grey Hackle, Silver Doctor . . . the skilled angler goes over all his flies, attempts to match fish and conditions before casting.

Nowadays the expert designer does much the same; with scientific care, he goes over the entire field of materials, rechecks the list of aluminum alloys, chooses a specific alloy, in a specific temper and form—*matches the alloy to the job and special requirements.*

For example, a manufacturer of roofing for use in smoke-laden atmospheres, may want strength with lightness . . . plus high corrosion-resistance.

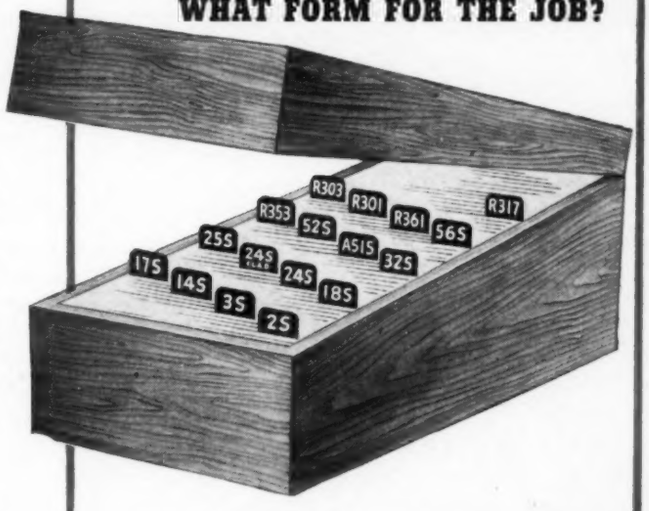
Another manufacturer, his product for indoor use, may require a high strength-to-weight ratio; he has no interest in corrosion-resistance.

In every case, there is a *right* Reynolds Aluminum alloy to use, available in various tempers and forms. Its selection is highly important, for it means a better, more serviceable product at lower cost.

Consider Aluminum . . . Consult Reynolds

Whatever your interest, Reynolds technicians are ready to co-operate with your engineers. Offices in principal cities. Phone nearest office or write Reynolds Metals Co., Aluminum Div., 2523 So. Third St., Louisville 1, Ky.

WHAT ALLOY? WHAT TEMPER? WHAT FORM FOR THE JOB?



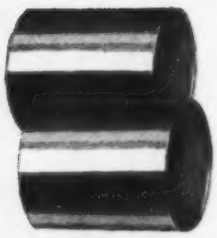
Match the alloy to the job, obtaining also the temper needed in the form best adapted to your production.

REYNOLDS METALS

REYNOLDS ALUMINUM

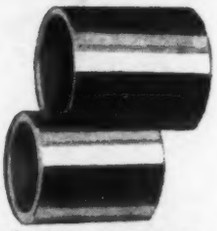
The Great New Source of

INGOT · SHEET · SHAPES · WIRE · ROD · BAR · TUBING · PARTS · FORGINGS · CASTINGS · FOIL · POWDER

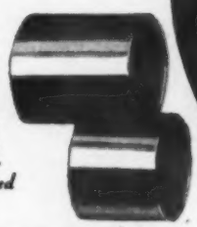


SHEET BRONZE
Plain or graphited

There is ONE RIGHT BEARING *for each* Application



CAST BRONZE
Plain or graphited



BRONZE ON STEEL
Plain or graphited

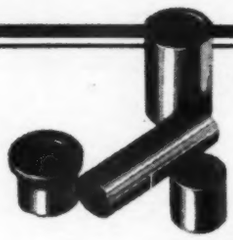
BRONZE and BABBITT

Johnson Bronze *helps* Manufacturers *make the* RIGHT *choice*

STEEL and BABBITT

One easy way to improve the performance of any motive unit is to check up on the bearings. Determine if they are the right type . . . correct in design . . . properly installed. See if they reduce friction to the very minimum . . . eliminate vibration . . . perform quietly for the longest period of time.

The easiest way to determine this is to call in a Johnson Bronze Engineer. Permit him to review your applications . . . to study the operating conditions. As we manufacture *all* types of Sleeve Bearings, we base our recommendations on facts . . . free from prejudice . . . backed by more than forty years exclusive bearing experience. You will find a Johnson Engineer as near as your telephone. Why not get together TODAY?



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Self-Lubricating

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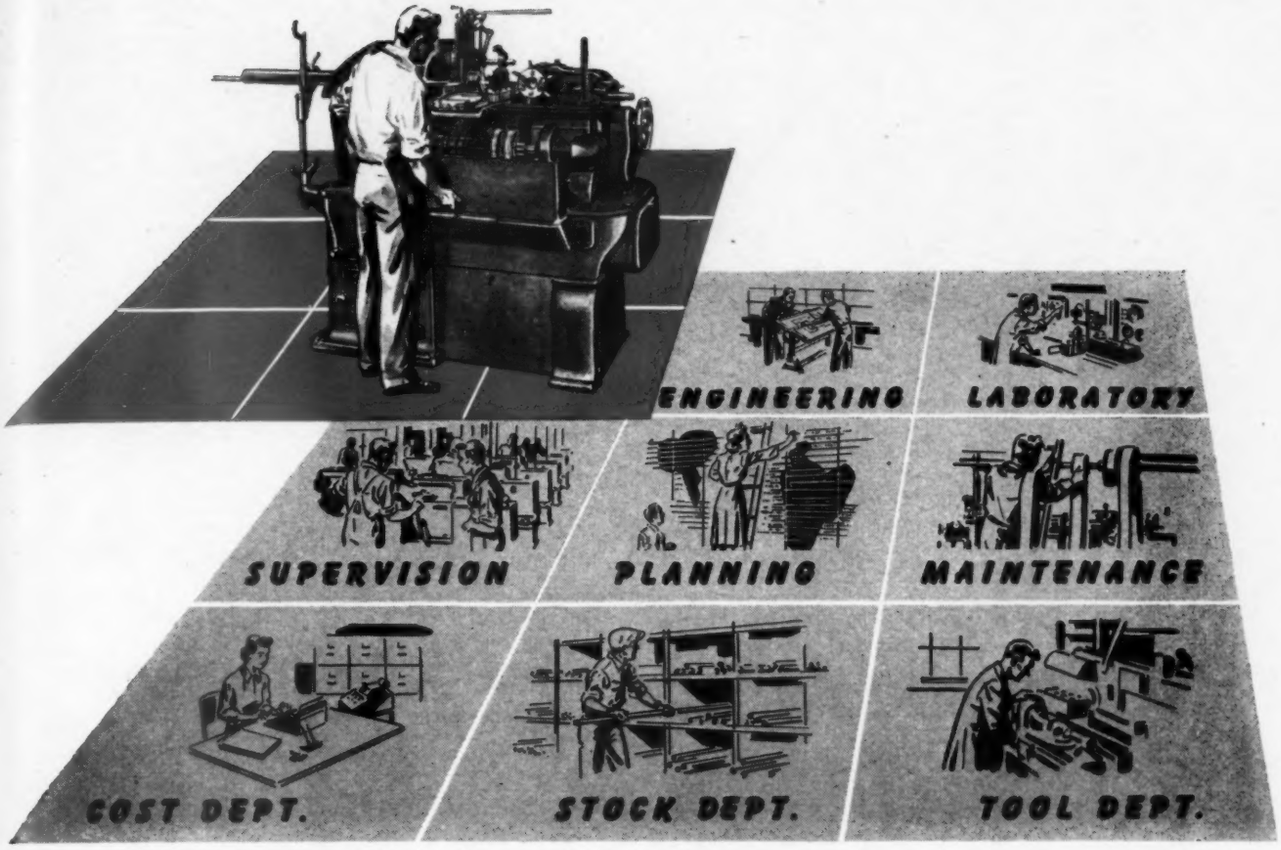


ONLY A FEW SQUARE FEET IN YOUR PLANT

. . . but they cast a Mighty Shadow

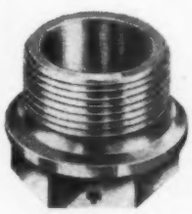
It's dollars to doughnuts you don't make your own machine screws! So why try to make your special production parts?

True — you can. All you'll need is a few automatics with special tools, some trained operators and supervisors, an expediter, and extra assignments for your tool room, engineers, maintenance crew, drafting room, stock clerks, purchasing department . . .

Every foot of space in your plant casts a mighty shadow: *Overhead,* which can be covered only by producing more finished goods that look better, are better, and can be sold for less money at a satisfactory profit. Don't let your production space cast a shadow over profits! Use every foot to make those things you're geared up to make . . . and let Corbin Screw produce your small parts.

You'll get "Blueprint-plus" in accuracy and finish, because Corbin M3 Facilities are geared up to turn out your special production parts efficiently. We have the Men, the Materials and the Machines to head, grind, roll thread, turn and shape these pieces accurately, economically . . . *and on schedule.*

P-1



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The American Hardware Corporation
NEW BRITAIN • CONNECTICUT
Warehouses:
New Britain • New York • Chicago

CORBIN

COME TO "CORBIN SCREW" FOR PROFITABLE *Production Parts*

Torflex FLEXIBLE BEARINGS

Torflex Bearings are designed to cover a wide range of applications in every field of industry.

For instance in the tractor field *Torflex* Bearings are used on the pivot axle shaft to accommodate oscillations of the bogie truck and cushion draw-bar pull. Illustration shows *Torflex* Bearings in track shoe pins, where they eliminate wear, shock and vibration thereby prolonging the life of the equipment. Once installed they require no care, no lubrication and work efficiently and dependably for years. The adaptability and versatility of *Torflex* Bearings account for their wide acceptance by industry.

Torflex Bearings are used on all types of machinery, can be made in practically any size, are low in cost, simple and readily incorporated in new or existing equipment.

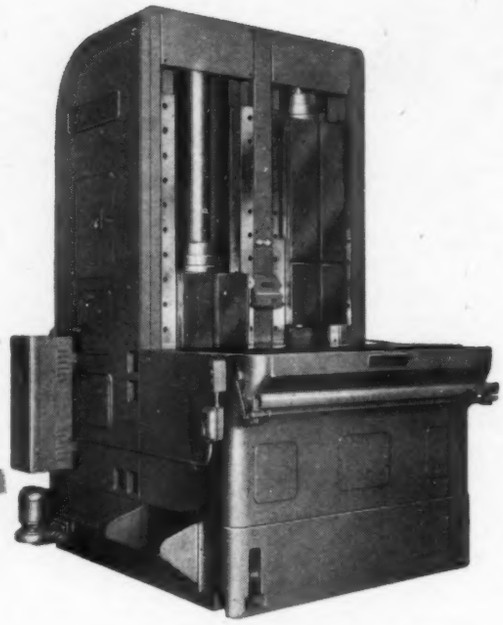
Send in for more detailed information.

HARRIS PRODUCTS CO.

5101 COWAN AVENUE

CLEVELAND 4, OHIO

★



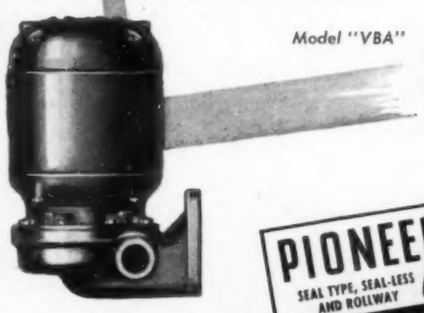
Better Broaching

When Modern Machines Team With

Pioneer Pumps

● Constant delivery of a heavily compounded fluid to the work point is essential for successful broaching. Pioneer Pumps—specified as standard equipment by leading machine tool manufacturers—are aiding many broaches to perform one of the most rigorous of all cutting operations.

Compactly streamlined, the Pioneer VBA enhances both the appearance and ability of machine tools. It functions efficiently in shallow places, beyond the range of most pumps, and is representative of the 400 standard models manufactured by Pioneer . . . each and every one of them an able ally for modern machines.



Model "VBA" Colonial Dual Ram Broach and Pioneer "VBA" Pump, shown above, form a combination ready to handle the toughest assignment.

PIONEER *Pumps*

SEAL TYPE, SEAL-LESS AND ROLLWAY

FOR PUMPING COOLANTS · CUTTING FLUIDS · ABRASIVE LIQUIDS · LUBRICANTS · WATER

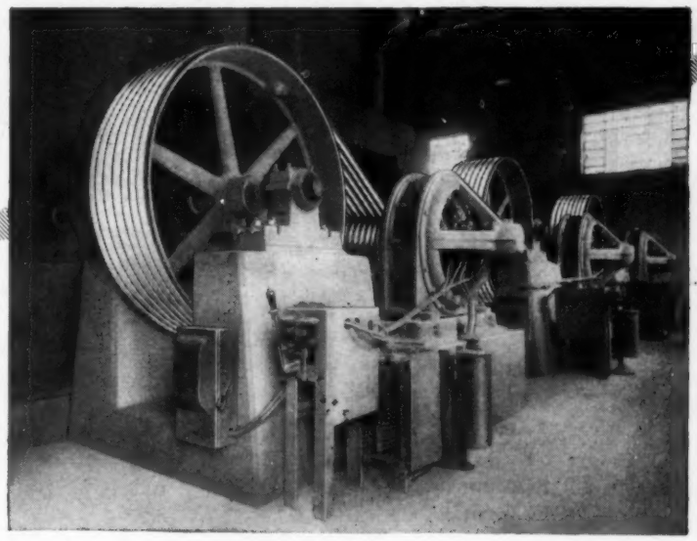
Pioneer Pump & Manufacturing Co.

19651 JOHN R ST. • DETROIT 3, MICHIGAN

Here is **WHY**

Your STANDARD Gates Vulco Ropes Are Today Giving BETTER SERVICE Than ANY V-Belts Ever Built Before!

EARLY IN THE WAR, it became perfectly clear that Army tanks, tractors and self-propelled big guns in *combat service* simply *had* to have V-Belts of greater strength and durability than had ever been built before. Gates developed these greatly superior V-Belts through intensified, specialized research — and here is why this fact is now important to YOU: —



✓ **Every Improvement developed by Gates for these Army V-Belts has also been added, day by day, to the quality of the Standard Gates Vulco Ropes which have been delivered to you.**

All Gates V-Belts are Built with
The Patented

This is one of the very few instances in which improvements developed primarily for military use could be passed on immediately to you. Ordinarily, *you* would have had to wait. An exception was made in the case of Gates V-Belts because it was recognized that industry needed the best possible V-Belts in order to achieve the greatest possible production —and maximum production was vitally essential.

That is why Gates has been able to pass on to you, day by day, every V-Belt improvement developed for our armed forces during the war—and that is why your *Standard* Gates Vulco Ropes are today delivering far better service than *any* V-Belts ever built before!

Gates

THE MARK OF SPECIALIZED RESEARCH

THE GATES RUBBER COMPANY

Engineering Offices and Jobber Stocks in All Large Industrial Centers

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PORTLAND 9, ORE., 333 N.W. 5th Ave. DALLAS 2, TEXAS, 1710 N. Market St. SAN FRANCISCO 3, CAL., 170 Ninth St.

8 ways Waldes

TRUARC RETAINING RINGS IMPROVE McINTYRE PRESSURE PUMPS

DESIGN SIMPLIFIED

This McIntyre pressurizing pump can be assembled quicker... easier.. better—thanks to design economy made possible by Truarc retention principle.

EFFICIENCY MULTIPLIED

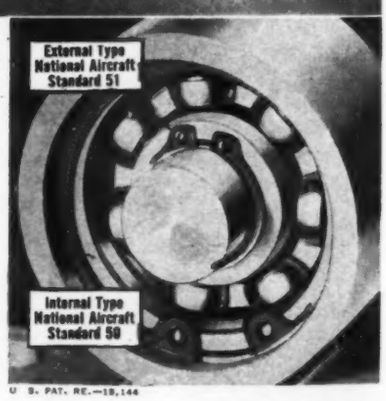
Aircraft depend on McIntyre pressure pumps, and Truarc Retaining Rings make McIntyre pumps more dependable by making possible fewer parts, better integrated parts.

Precision

1. Waldes Truarc allows lighter, more compact design.
2. Permits vital dimensions tolerance to ±.0001.
3. Permits exact assembly of bearings and thrust washers with less machining.
4. Maintains accurate position of parts.

Performance

5. Cuts assembly and disassembly time to a fraction.
6. Greatly reduces danger of injury to other precision parts.
7. Gives greater protection to drive shafts at 12,000 RPM.
8. Has never failed in service.



U. S. PAT. RE.—18,144

Our engineers will be glad to show you how this superior retention principle can be applied to *your* machines and products. Write Dept. B-3.

WALDES TRUARC RETAINING RINGS

TRADE MARK

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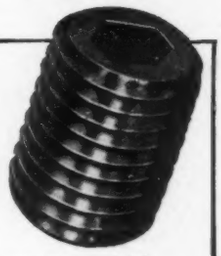
Ability to withstand heavy impact load is an attribute of Bunting Cast Bronze Sleeve Bearings. The large area of contact with its oil film insulation serves to distribute and cushion the impact. The Bunting Brass & Bronze Company, Toledo 9, Ohio. Branches in Principal Cities.

36

Bunting

BRONZE BEARINGS ☆ BUSHINGS ☆ PRECISION BRONZE BARS

When you're in a TIGHT spot...specify *Mac-its*



Mac-it alloy steel hollow set screws are milled from the solid bar, with die-cut threads. Hex sockets are generated by a special process insuring full-depth accuracy. Heat-treated for maximum strength and to prevent rounding out or splitting of the socket or upsetting of the point.

Mac-it products include Socket Head Cap Screws, Hollow Set Screws, Hexagon Head Cap Screws, Square Head Set Screws, Stripper Bolts, Hexagon Socket Pipe Plugs. *All are made of alloy steel and heat-treated.*

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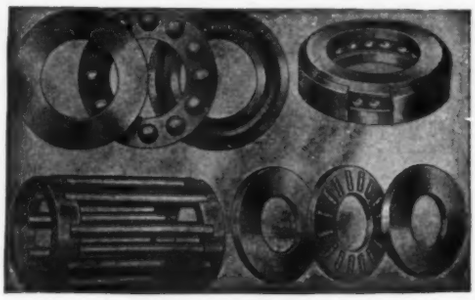

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"Danly Knurled" is noted for high quality and accuracy. Specify it by name "Danly Knurled."

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The proof of the puddin' on any piece of equipment rests on its performance, based on everyday use under all types of working conditions.

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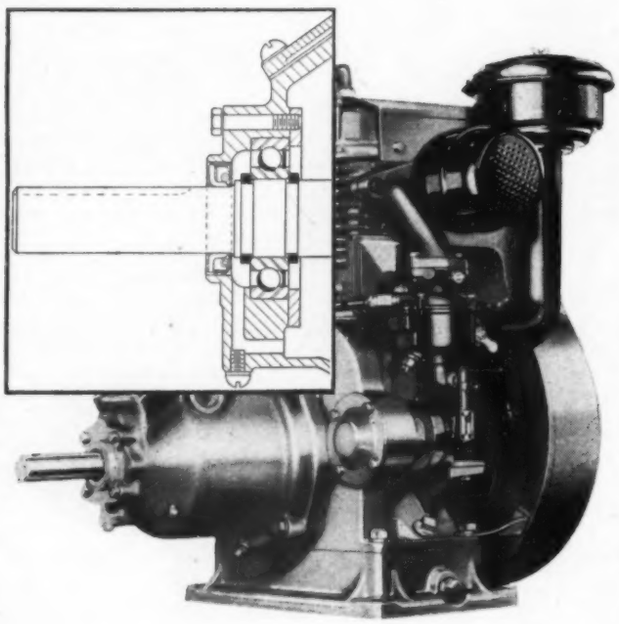

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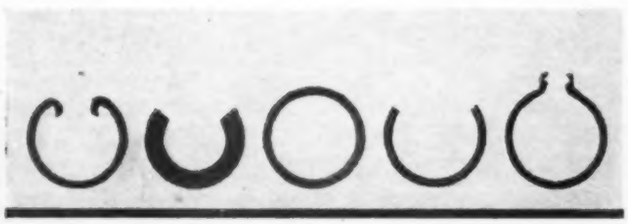

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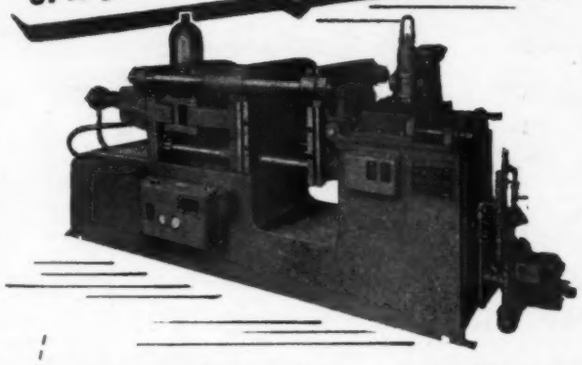

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Finished assemblies — flexible, durable, neat, economical.

IT IS no small wonder that American Flexible Metal Hose and Tubing has received such widespread use in practically every industry in America. It is as flexible in its application to either product design or industrial maintenance as it is in its actual construction.

The picture above, for instance, shows the latest development in Flexible Metal Tubing combined with synthetics. The result is an absolutely moisture proof, mechanically strong conduit for covering electrical wiring on machine tools. American developed this special product at the request of the machine tool and automotive industry. Brass fittings were especially designed to be either factory attached or for assembly on the job.

This is just one typical example of the thousands of special Flexible Metal Hose and Tubing assemblies that we have designed to solve intricate engineering requirements.

Whether your problem involves the conveying of steam, oil, water, gases or refrigerants at high or low temperatures and pressures — whether yours is a problem of controlling vibration, connecting moving parts or providing for misalignment of tappings — American has a special assembly, flexible enough in both construction and application to give you the right answer.

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ANACONDA
from mine to consumer

American Metal Hose

AMERICAN METAL HOSE BRANCH of THE AMERICAN BRASS COMPANY

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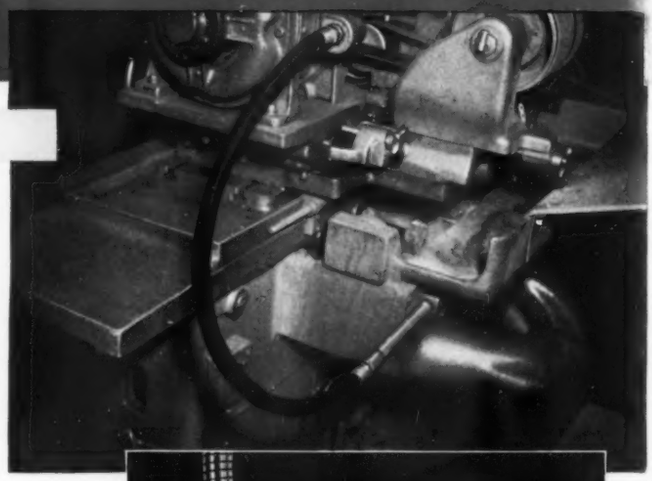
In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

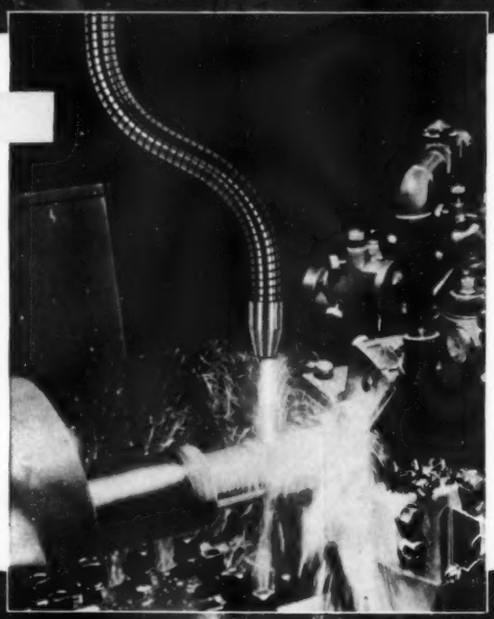
For DESIGN, PRODUCTION and MAINTENANCE

Specify AMERICAN *flexible* METAL HOSE and TUBING



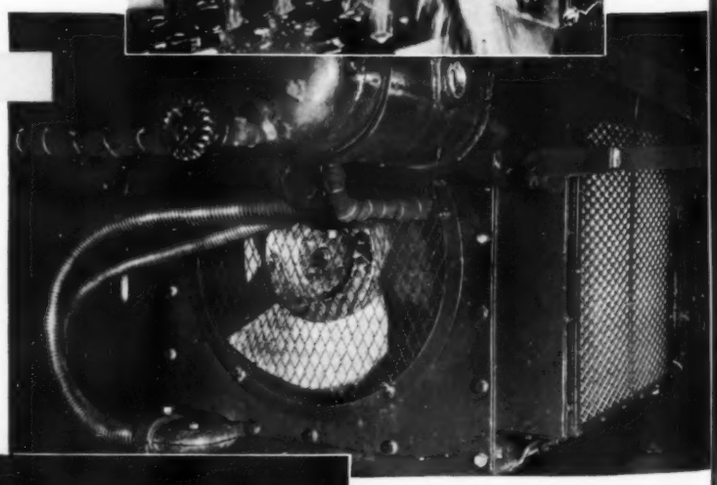
DESIGN

Thousands of machine and product designers have found that their equipment is more dependable in the long run when they specify American Flexible Metal Hose or Tubing — "right" from the start — because right from the start, they can be sure of a flexible assembly, designed by capable engineers to give the greatest service at the least expense. Where space saving, appearance or positive mechanical dependability are important features, don't take a chance — specify "American."



PRODUCTION

The war years proved that Flexible Metal Hose and Tubing Assemblies built by American are made to stand up under rigorous production schedules. For instance, one of our customers, a fibre board manufacturer, used American Seamless — the flexible tubing made from seamless tubes — over a period of 9 years in continuous twenty-four hour production WITHOUT FAILURE OF A SINGLE LENGTH. Production men would do well to inquire about the use of American Metal Hose to safeguard production schedules.



MAINTENANCE

One of the features of American Flexible Metal Hose and Tubing is that couplings can be furnished that are just what the maintenance engineer needs . . . — the type of reattachable couplings that can be put together on the job quickly with ordinary shop tools. To the maintenance man, this means a minimum of spares because abnormal failures can be repaired quickly with no loss of time to valuable production machinery. Write for literature on American Flexible Metal Hose and Tubing.

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American Metal Hose

AMERICAN METAL HOSE BRANCH of THE AMERICAN BRASS COMPANY

General Offices: Waterbury, Conn. Subsidiary of Anaconda Copper Mining Company

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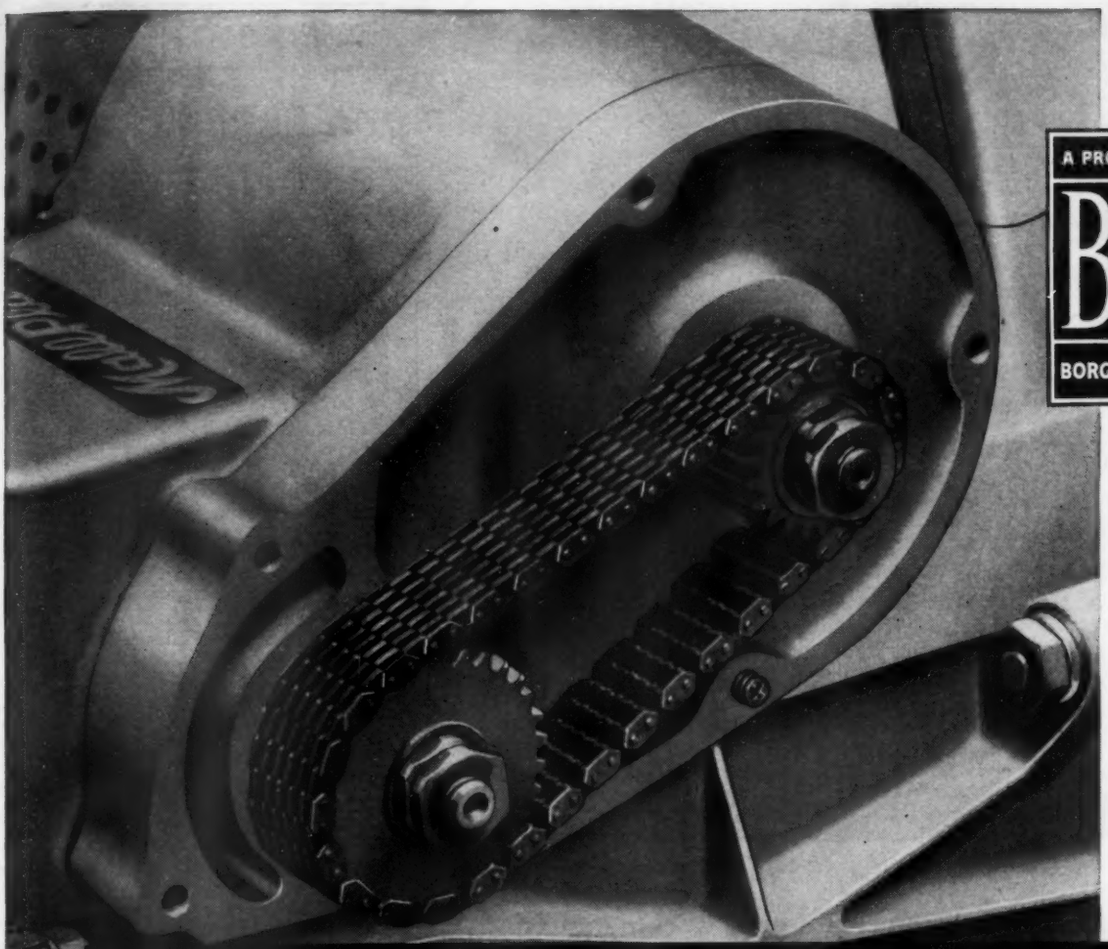
ANACONDA
from mine to consumer



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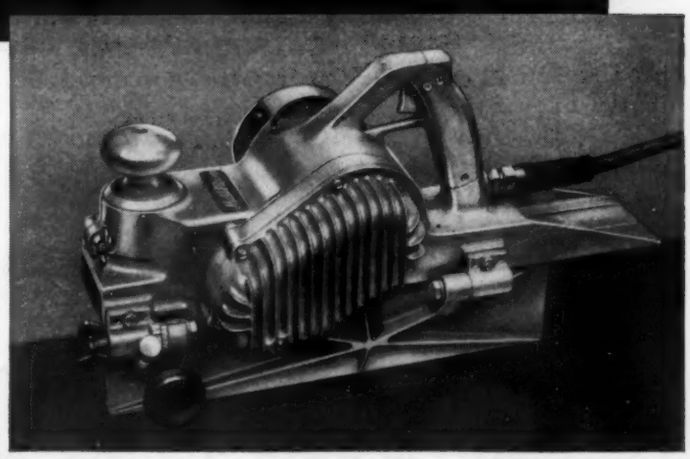

Only chain can assure the positive drive a surface sander must have. On Mall Tool Company's Sander, Morse 3/16-inch pitch Silent Chain, in a compact assembly, using teeth not tension, gives maximum drive efficiency. MORSE CHAIN CO., ITHACA, N. Y., DETROIT 8, MICH.

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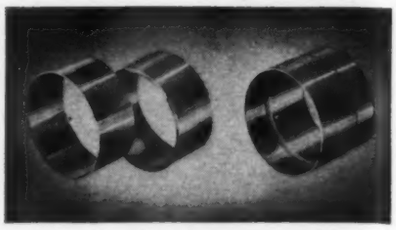

Laboratories that in peace as in war are pacing the advance of American industry demand accuracy above everything else. It is no wonder, then, that one of the largest laboratories in America came to Ace for these pressure support rings.

Here is a job that calls for exceptionally fine tolerances. The thin-walled ring had to fit snugly over the thick-walled ring—a free fit . . . but not loose. Not only was it necessary to hold close tolerances for size, but also for accurate concentricity. From the selection of special steel bar stock, through the machining, heat treating, grinding, and inspection operations, this was a typical Ace precision job.

Such jobs are merely a part of the daily grind at Ace, where accuracy applied to mass production was pioneered. Management skill and modern equipment are turning out tolerances as close as .0002" (which makes paper seem mattress-thick) and finishes which a speck of dust or a warm hand distorts.

If you are looking for a source of supply for small parts or assemblies from the tool and die stage—on through stamping, machining, heat treating and grinding, it will pay you to consult Ace. Ace will make you high-man in the coming competitive market. Send us a sketch, blueprint, or sample for quotation.

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ACE

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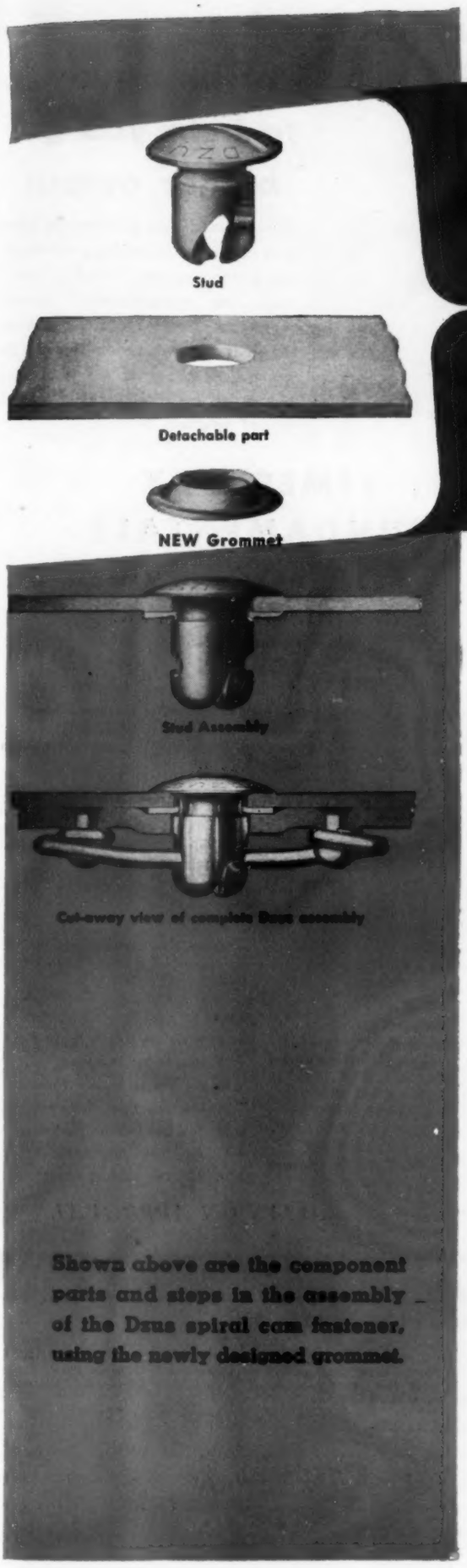
NEW INSTALLATION METHOD FOR DZUS FASTENER STUDS CUTS ASSEMBLY TIME 50%



Shown above are the component parts and steps in the assembly of the Dzus spiral cam fastener, using the newly designed grommet.

A newly developed Dzus grommet slashes installation procedure about 50%. This speeds up the assembly of Dzus fasteners for mass production operations.

This is the way it works. Dzus fastener studs are placed in the holes drilled or punched in the material to be fastened. The grommet is then slipped over the end of the fastener stud and flattened with a single tool. **All types of Dzus fasteners may be installed in this manner.**

If you have a fastening problem on a hinged or removable part, let a Dzus engineer help you. There is a Dzus fastener to meet every requirement.

*The word Dzus is the registered trade mark of the Dzus Fastener Co., Inc.

DZUS FASTENER CO., INC.

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IN CANADA: RAILWAY AND POWER ENGINEERING CORP., LTD.

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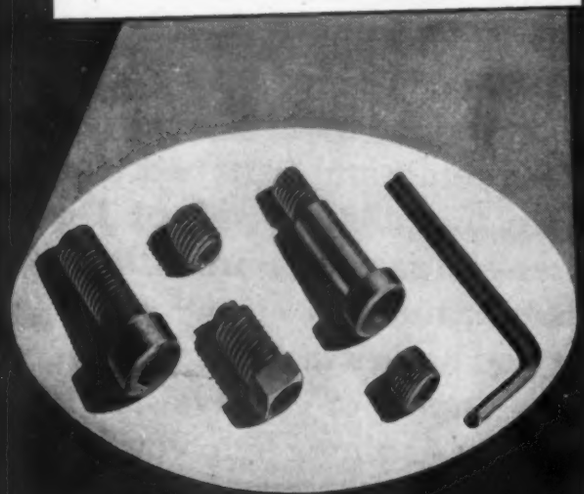
These Fine Products are sold only thru Authorized Distributors



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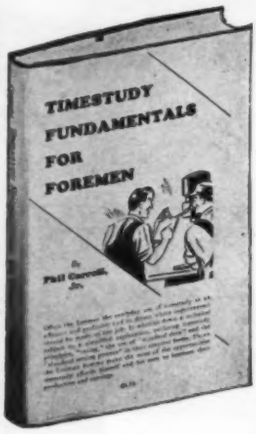
An ABC book of timestudy to help you get bigger output



Stressing exactly the problems the foreman encounters in making a timestudy and in applying new, improved standards, this straightforward manual shows just how to go about making the study, tells what to do in order to get the most out of the study, in bigger and better output and in improved working methods.

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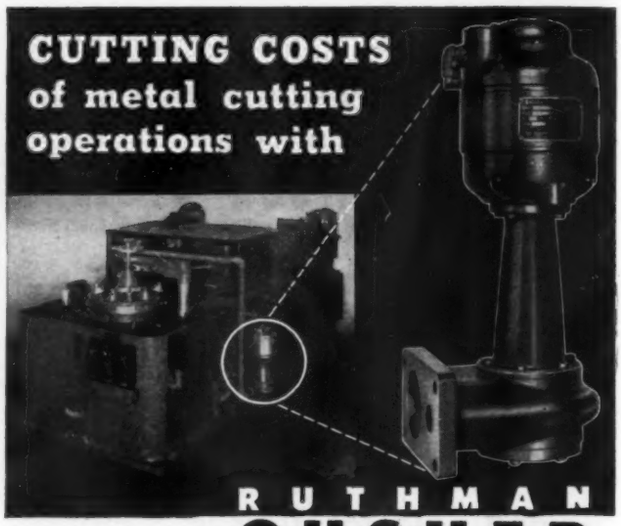

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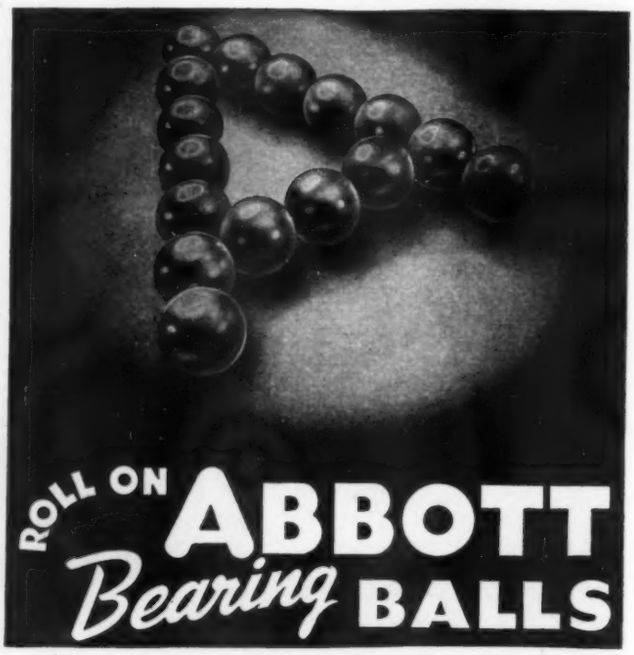

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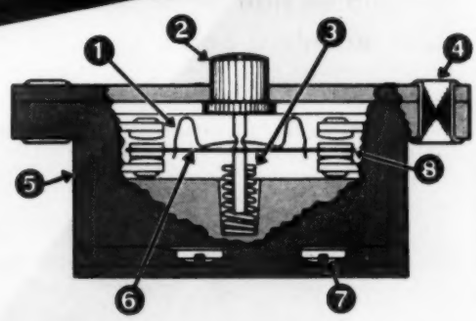
A study of the actual-size construction sketch at right will tell you that the mechanism, though small in size, is husky enough to do a man-size job. It took almost unbelievable punishment during months of laboratory tests—hundreds of times greater than required in actual service. And *thrived* on it!

Your nearby Square D Field Engineer will be glad to drop around with a sample. Compare it with any other switch of its type you've ever seen or used. You'll agree it has *everything* needed.



CONSTRUCTION SKETCH
• *Actual Size* •

VOLTS AC	AMPERES	
	NORMAL	INRUSH
110	15	40
220	10	10
440	6	10
550	5	8

DC	.020" GAP	.040" GAP
115	.5	2.0
230	.25	.5
550	.05	.1

Write for Bulletin 204
Square D Company
4041 N. Richards St.
Milwaukee 12, Wisconsin

1. **Simple Operating Mechanism,** consisting of only two alloy leaf springs, has no dead center position and gives exceptionally long life.
2. **Operating Force** approximates 9 ounces. Full stroke of button is .110" divided into .057" pretravel and .053" overtravel. Differential is .025".
3. **Compression Return Spring** of stainless steel insures positive operation and long life.
4. **Compact Dimensions.** Brass-lined mounting bosses conveniently placed with respect to terminals and operating button.
5. **Husky Melamine Case** is not easily damaged through faulty installation or accidental impact, and is highly arc-resistant.
6. **Heavy Contact Blade** is entirely separate from operating mechanism.
7. **Four Terminals** have No. 6-32 binderhead screws suitable for No. 14 wire.
8. **Separate NO and NC Circuits** have double break, silver contacts. (See ratings at left.)

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

Announcing

BALLFLEX

ANGULAR AND AXIAL

Anti-Friction Flexible Coupling

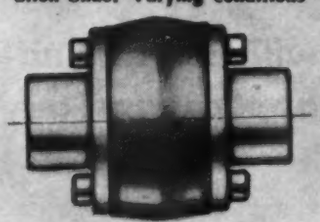
● Flexibility by mechanical means only! No fibre discs! No rubber discs! No sliding members! Friction is lowered to the minimum by the use of hardened steel balls through which all torque is transmitted. Free rolling movement eliminates side thrust and insures long life to both coupling and mounting bearings.

The only flexible element used is the overall permanent seal that retains the lubricant and keeps out dust and dirt—a new synthetic product impervious to oil.

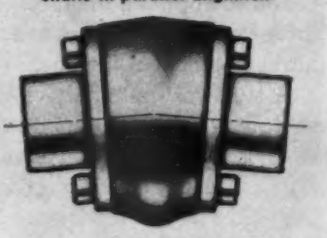
Write for Illustrated Literature and Full Information

ARMY E NAVY

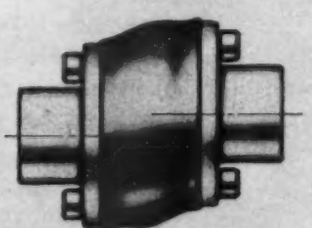
Exaggerated to show Ballflex Operation Under Varying Conditions



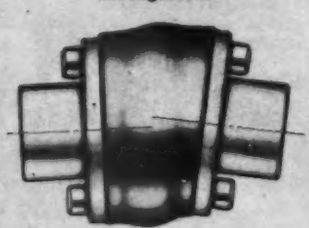
Normal operation with connected shafts in parallel alignment



Showing the effect of angular misalignment



Showing the effect of parallel misalignment



A combination of angular and parallel misalignment

Manufacturers of

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The GEAR GRINDING MACHINE COMPANY

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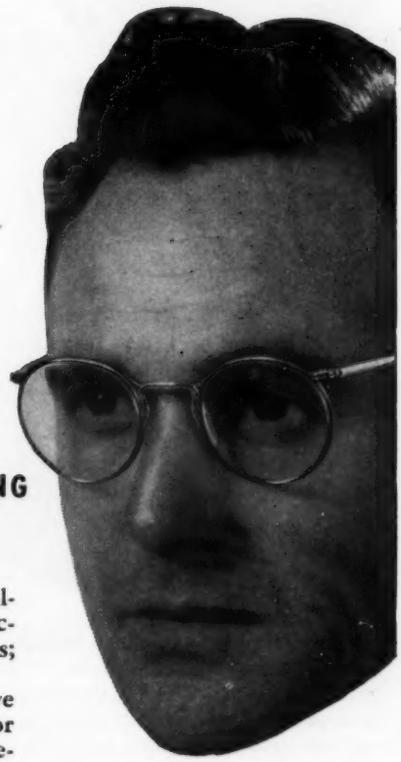

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Workers like the comfort and appearance of AO Ful-Vue Safety Goggles. *You'll* like the efficient eye-protection they afford — with consequent reduction in costs; their unusual durability — for maximum economy.

Made in three eye and three bridge sizes; with 6 Curve Super Armorplate Clear or Calobar lenses — with or without side shields. Your nearest AO Safety Representative can supply you.

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(Dimensions ¼ inch thick to 10 feet diameter, in any shape)
MAY BE THE ANSWER TO YOUR "IMAGINEERING"

●Did you know that intricate metal shapes can be spun in any quantity — one or thousands — yet even in small quantities tool costs are negligible?

Did you know that copper or aluminum to ½" thick and stainless or Monel to ¼" thick can easily be spun to any specifications?

As pioneers in the spinning technique, we can assist in meeting most requirements for experimental parts and production runs. Our highly skilled craftsmen produce spun parts to micrometer specifications. Our engineering department is at your service to help in solving your metal working problems.

Facilities for deep drawing—including a 400 ton hydraulic press.

Write for illustrated literature—see photographs of some "idea inspiring" spinnings.

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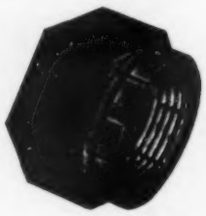
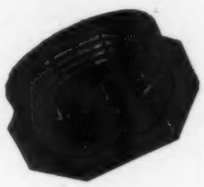


A One-Piece LOCK NUT

Pat'd & Pats. Pend. **FLEXLOC**

That "Holds Tight"



Yes . . . it's a two-in-one nut because, *all* the threads, including the locking threads, help to carry the load.

Pat'd—Pats. Pend.

- It is of one-piece construction
- It can be made of any of the conventional nut materials
- Every thread—including locking threads—takes its share of the load
- Its construction is especially advantageous for maximum strength and dependability of low and thin nuts
- It accommodates itself to a very wide range of thread tolerances
- It can be used over and over again without losing its ability to lock
- It is not affected by temperatures likely to be met within the field of Mechanical Engineering
- Being a "stop" nut, it stays locked in any position on a threaded member

Sizes from #6 to 1" in diameter.

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The Famous "Unbrako" Socket Screw Products are also made by us.

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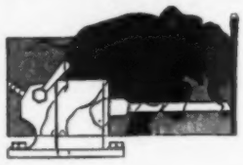

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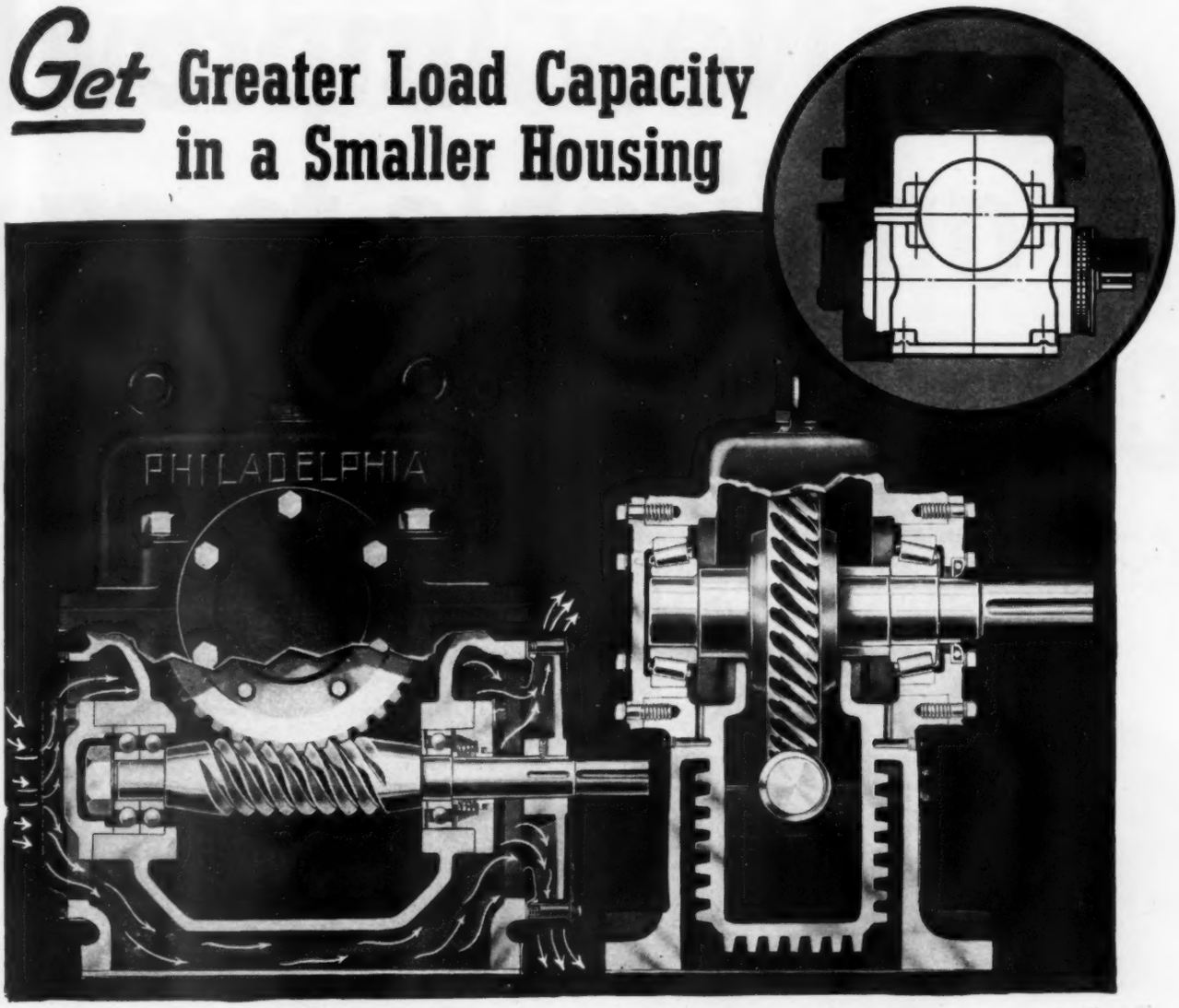
Get Greater Load Capacity in a Smaller Housing



...with the Philadelphia AIR KOOLED Worm Gear Speed Reducer

At the upper right is shown the comparative sizes of a size 675 Type AT standard unit (in blue) and a size 475 AirKooled unit. Both deliver 20 HP at 1750 RPM. Ratio 4 6/7 to 1.

The cut-away drawings show the double-walled, finned housing and the flow of air around the oil reservoir.

Considerable *space* and *weight* savings have been made possible by the design of Philadelphia AirKooled Worm Gear Reducers as compared with standard heavy duty type worm gear units.

The AirKooled design features a suction fan, mounted on the worm shaft, which draws air through the double-walled, finned housing. This dissipates generated heat, and thereby maintains a higher contact oil film strength and greatly increases the horsepower ratings at worm speeds of 580 and 1750 RPM. For all ratios at 1750 RPM the ratings are approximately doubled, so the AirKooled unit is about two sizes smaller than a standard unit of the same capacity.

Let us tell you what these savings can mean to you.

SEND FOR BULLETIN 250 .... *on your Business Letterhead*

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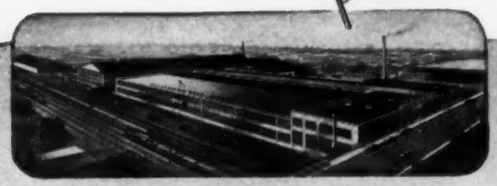


Industrial Gears and Speed Reducers
LimiTorque Valve Controls

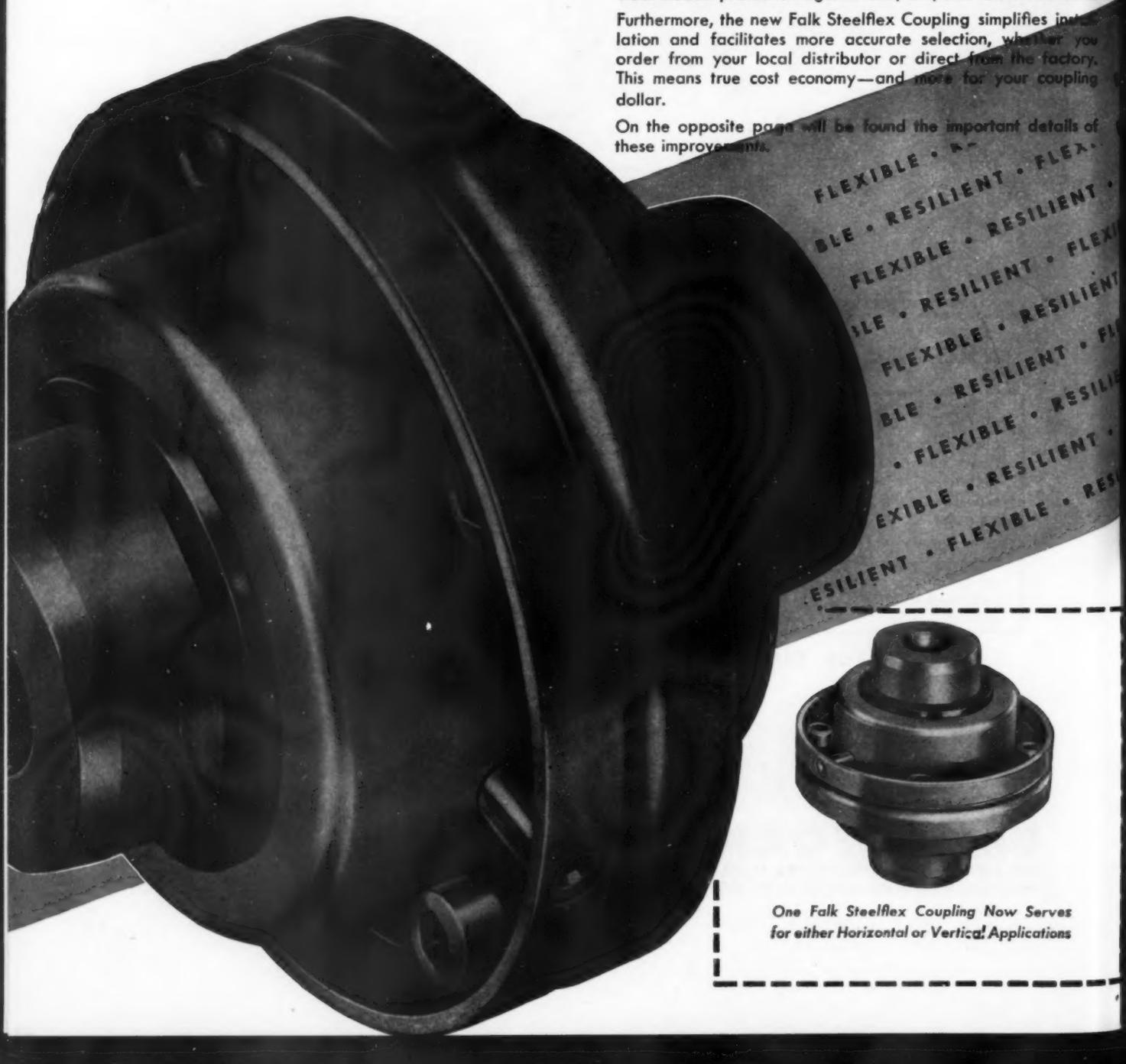
The New Improved St
is applicable to over
90% of all installations

Falk engineers, after years of field experience and laboratory study, now present an improved coupling design that will meet over 90% of all installation requirements.

The new design Falk Steelflex Coupling is equally efficient in either vertical or horizontal applications. It has a new wide shoulder seal ring that keeps the cover in position, and provides added protection against dust, dirt, and loss of lubricant.

Furthermore, the new Falk Steelflex Coupling simplifies installation and facilitates more accurate selection, whether you order from your local distributor or direct from the factory. This means true cost economy—and more for your coupling dollar.

On the opposite page will be found the important details of these improvements.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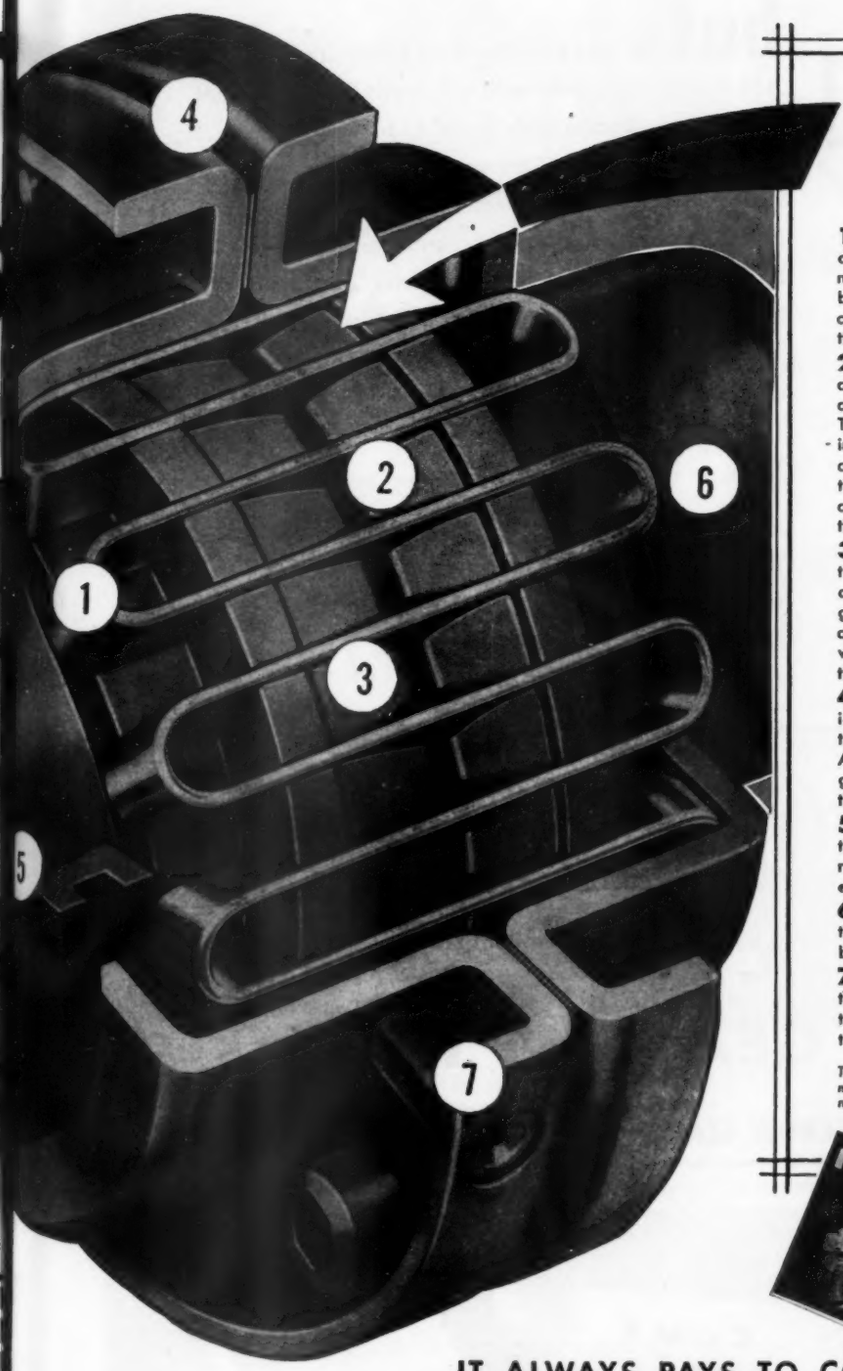
One Falk Steelflex Coupling Now Serves for either Horizontal or Vertical Applications

Steelflex Coupling



In Addition to Falk Coupling Flexibility and Torsional Resilience YOU NOW GET ALL OF THESE EXCLUSIVE FALK FEATURES

1. ***Resilient Grid Member*** — Shock loads are reduced by deflection of the resilient steel grid member which connects the two hubs of the coupling. Vibration is dampened by a change in natural frequency which takes place in the coupling with the change in load; the action of pressing the grease between the hub teeth and the grid member.

2. ***New Ease of Alignment*** — The diameter of the coupling at the gap between two hubs is turned to a true cylinder — both hubs being exactly the same diameter. This feature makes it unnecessary to turn either the driving or driven shafts when aligning. Parallel alignment is checked quickly with the end of a straightedge across the two hubs and with a feeler gauge. Angular alignment is checked with spacer block and feelers in the gap between the hub faces.

3. ***Misalignment Flexibility*** — The raised portion of the teeth of the hubs on which the cover rides permits free articulation between the two hubs, the cover, and the grid member. This construction enables the coupling to compensate for angular or parallel shaft misalignment without placing harmful loads on the connecting shafts or their bearings.

4. ***Floating Cover*** — The two steel cover halves are identical and are provided with guard flanges to cover the capscrews and nuts which hold the half covers together. A gasket is used between the half cover faces to seal the grease inside the coupling. The cover floats on the top of the raised portion of the hub teeth.

5. ***Seal Rings*** — The openings between the cover and the hubs are sealed with Neoprene rings which are grease-resistant and therefore prevent loss of lubricant and entrance of water, dust, or other foreign material.

6. ***Identical Parts*** — Both hubs and both cover halves of this all-steel coupling are identical. Each hub can be bored and keyseated for various shaft diameters.

7. ***Lubrication*** — Grease fittings are used to facilitate the addition of a nonfluid lubricant after initial installation. A full lubricant supply inside the coupling is sufficient to allow months of continuous operation without refilling.

There are 13 types and 33 sizes of Falk couplings to meet all requirements. For specific information and recommendations to meet your needs, call the nearest Falk representative or distributor.

This new bulletin contains full information on the design of this new coupling, simplified method for selection, load classification, service factors and dimensions. Send for your copy.

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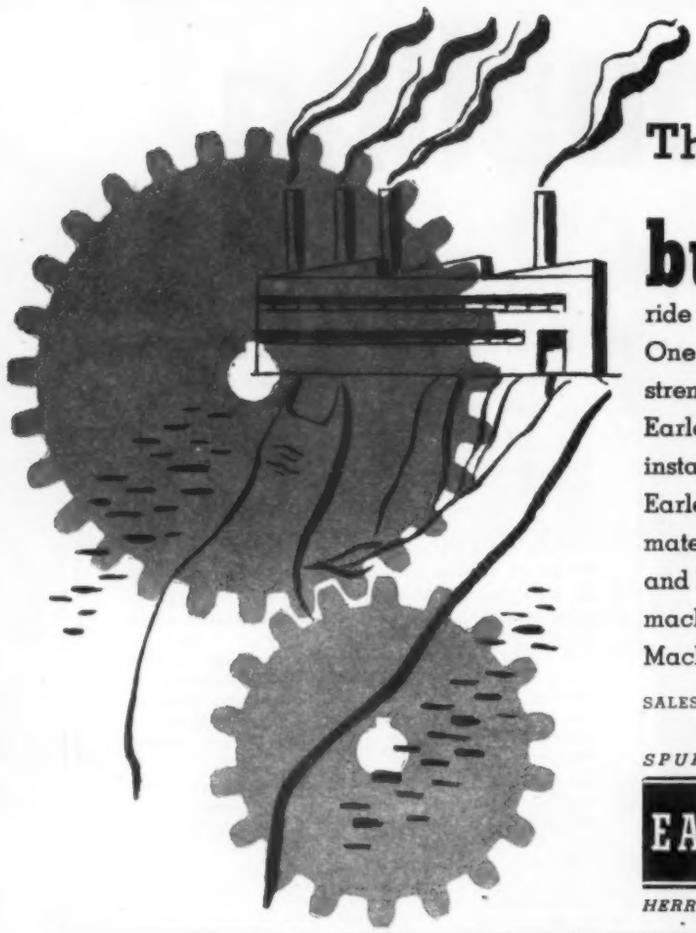

The seller's in the saddle now,

but the day's on the way when the buyer will ride again. Be ready with a "re-vitalized" product. One way to accomplish this is to build sales-winning strength and service into your product by incorporating Earle Gears. Time has tested Earle Gears in hundreds of installations throughout the United States and abroad. Earle custom-cuts all types of gears, in all practical materials, and in sizes from inches up to 30 ft. in diameter, and builds gear reducing units, racks, special operating machinery, etc. Request bulletin 42-G. The Earle Gear & Machine Co., **4723** Stenton Ave., Philadelphia 44, Pa.

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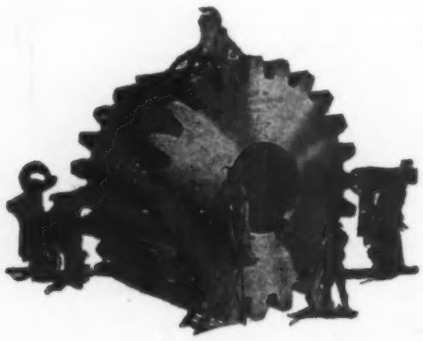

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In the manufacture of automotive gears, Sier-Bath has an excellent record. We have the experience as well as the equipment for cutting the hardest, toughest gear steels. The completeness of our heat treating department insures hardening to your requirements. To maintain tolerances within extremely close limits, our air conditioned checking department is held at a constant temperature and equipped with mechanical checkers. All checks are electrically recorded and copies may be had upon request. Send us your specifications for quotation.

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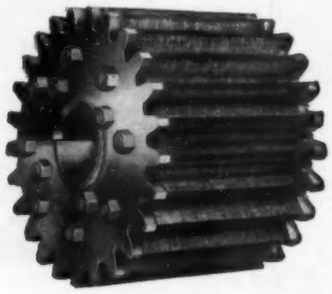
Life!
WHEN IT'S A STAHL GEAR



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Rawhide spur pinion mounted on cast iron center. Pinion 21.600" O.D., 17" face overall, 15" face of rawhide, 1" brass flanges each side, 25 teeth 1¼ D.P., 5¾" bore. Stahl is geared to serve you well.

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GEARED FOR DEPENDABILITY

THE FIRST MESSAGE from the Army's first Boeing Superfortresses over Japan, on the Yawata mission of June 15, 1944, was transmitted by a *Collins* radio transmitter, equipped with the Autotune, automatic tuning device. Upon its reliability has depended the success of many air operations since.

Gears for the assembly in the Autotune, shown here, required tolerances of .0005", and Collins Radio specified *Beaver Gears* because of their consistent accuracy and fine finish.

This quality of production offers the same dependability at no extra cost for your gear requirements in *radio, electronics, instruments and communications.* You are invited to submit prints for quotation.

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Having Trouble Getting Castings?

Perhaps you can solve your problem by changing over to stampings. Note the case illustrated here. The Parks-Cramer Company formerly cast these support brackets (as shown in the rear view above). They weighed approximately four pounds each. By changing to stampings, weight was reduced to 14 ounces, and production costs lowered. As the brackets are used to support track for automatic traveling cleaners over cotton spinning machines, lighter weight offers these definite advantages: Installation is greatly simplified and there is no longer any danger of breakage if the brackets are dropped in transit or in use.

A central extruded tapped hole is added to some of these brackets (as shown in forward view above).

If you have a similar problem, Presteel engineers will be glad to help you solve it. Write to:

WORCESTER PRESSED STEEL CO.

203 Barber Avenue **Worcester 6, Mass.**

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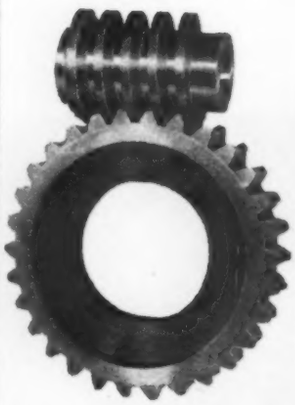

The manufacturer, design engineer and production expert make the selection of dependable gears one of their definite responsibilities.

It is common practice in thousands of plants to specify *Cincinnati Gears, Good Gears Only*. Their precision control, accuracy and performance guarantee assured dependability.

Each Cincinnati Gear is made to fit your particular specifications . . . it saves time and money and puts the right gear in the right place.

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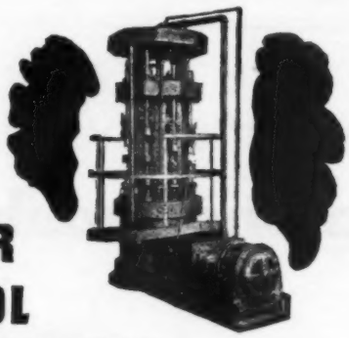

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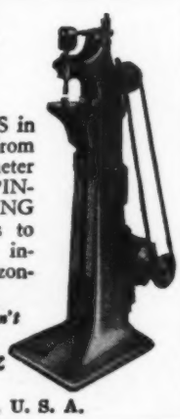
Write for literature and don't forget to send samples.



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85 Silliman Ave., Bridgeport, Conn., U. S. A.

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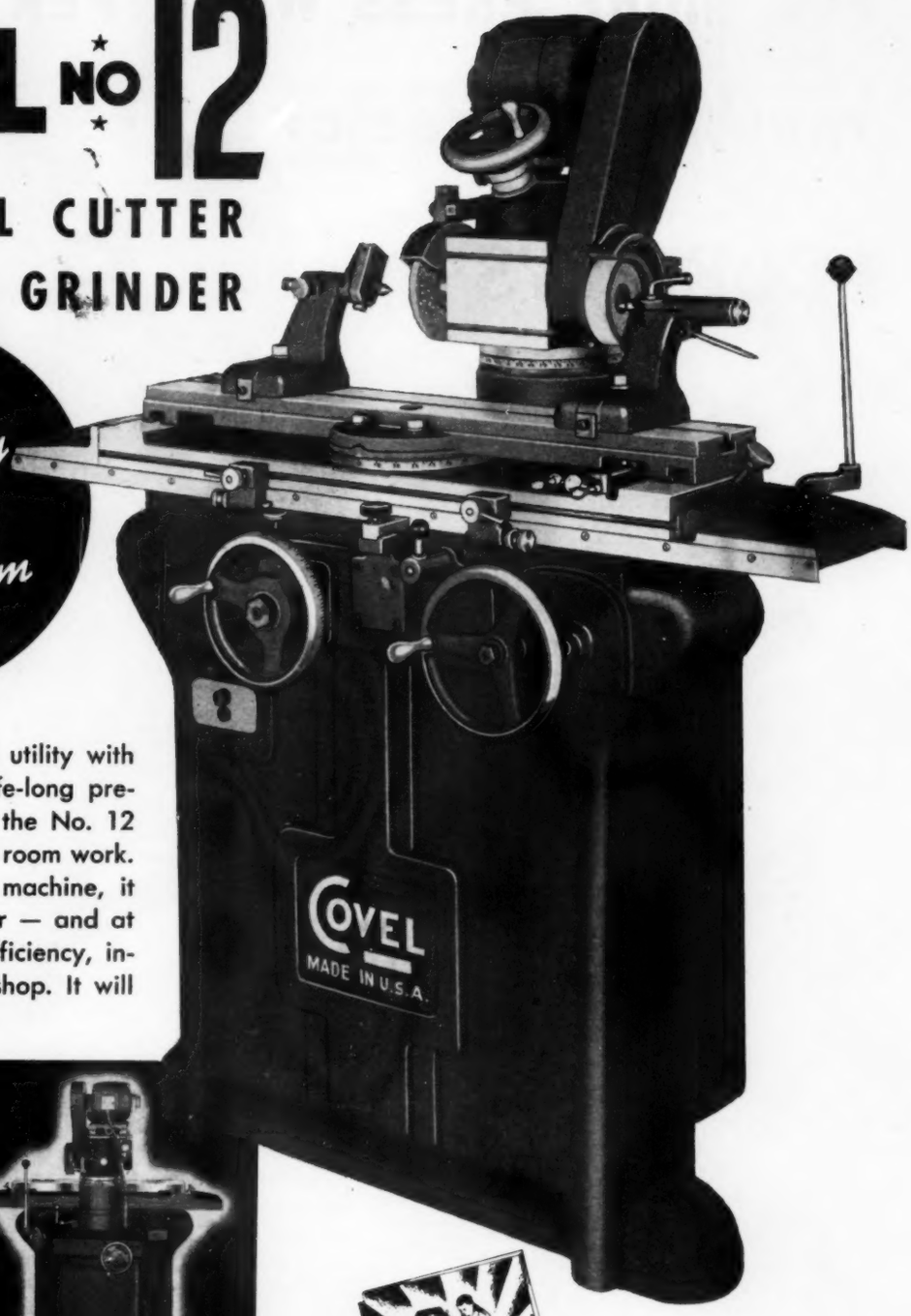
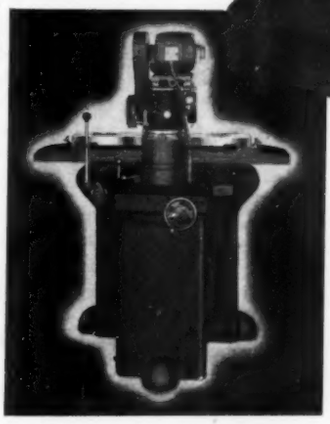
UNIVERSAL CUTTER AND TOOL GRINDER

for Modern Efficiency in your Tool Room



Combining a universal utility with high productivity and life-long precision, Covel offers you the No. 12 for a wide range of tool room work. A rugged, dependable machine, it will do more jobs, better — and at less cost. For modern efficiency, install a No. 12 in your shop. It will pay for itself quickly.



Rear view shows simple, clean-cut design of entire machine. Base is ribbed for rigidity — one of a multitude of advantageous features built into this time-saving grinder.

See Your nearest Dealer or write for 12-page bulletin A-66

GRINDING MACHINERY SINCE 1874

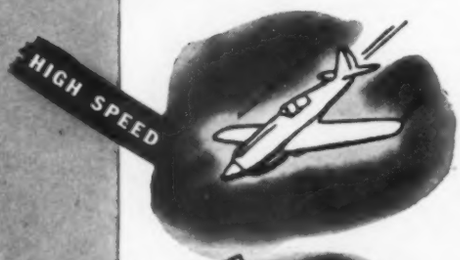
COVEL INDUSTRIAL GRINDERS

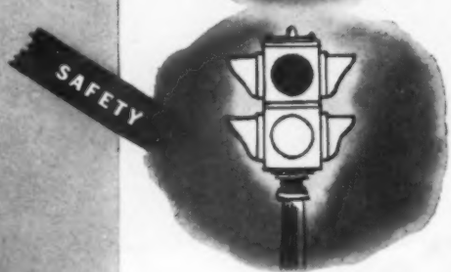
COVEL MFG. CO., BENTON HARBOR, MICHIGAN U. S. A.

FOR MORE PRESS WORK PER DOLLAR—

TAKE ADVANTAGE OF

FEDERAL'S





AVAILABLE IN 8 SIZES—CAPACITY, 6 TO 80 TONS

Because Federal Presses are in such great demand today, delay in shipment is unavoidable. But remember—Federals are worth waiting for!

If you're looking for a way to offset increasing labor rates and meet the demand for lower production costs—take advantage of the many Federal features that assure more press work per dollar. Every day Federal Presses are performing a wider variety of jobs never before regarded as press operations. Their versatility is practically unlimited. Primary, secondary, and assembly operations are handled quickly and safely—with extreme accuracy. Burnishing, broaching, forming, staking, and high speed marking are handled with ease. Result: production speed is often increased; production costs cut to remarkably low figures. Write for catalog of complete Federal Press line.

THE FEDERAL PRESS CO.

1003 Division Street, Elkhart, Indiana

Telephone 2831

FEATURES

Front Operated Recline • Timken Roller Bearing Flywheels • Frame-Anchored Knockout Bracket • Symmetrical Rams • Longer "y" Ways and Gibs • Oversize Crankshafts • Non-Repeat Clutch Mechanism • Safety Latch Spring

FEDERAL

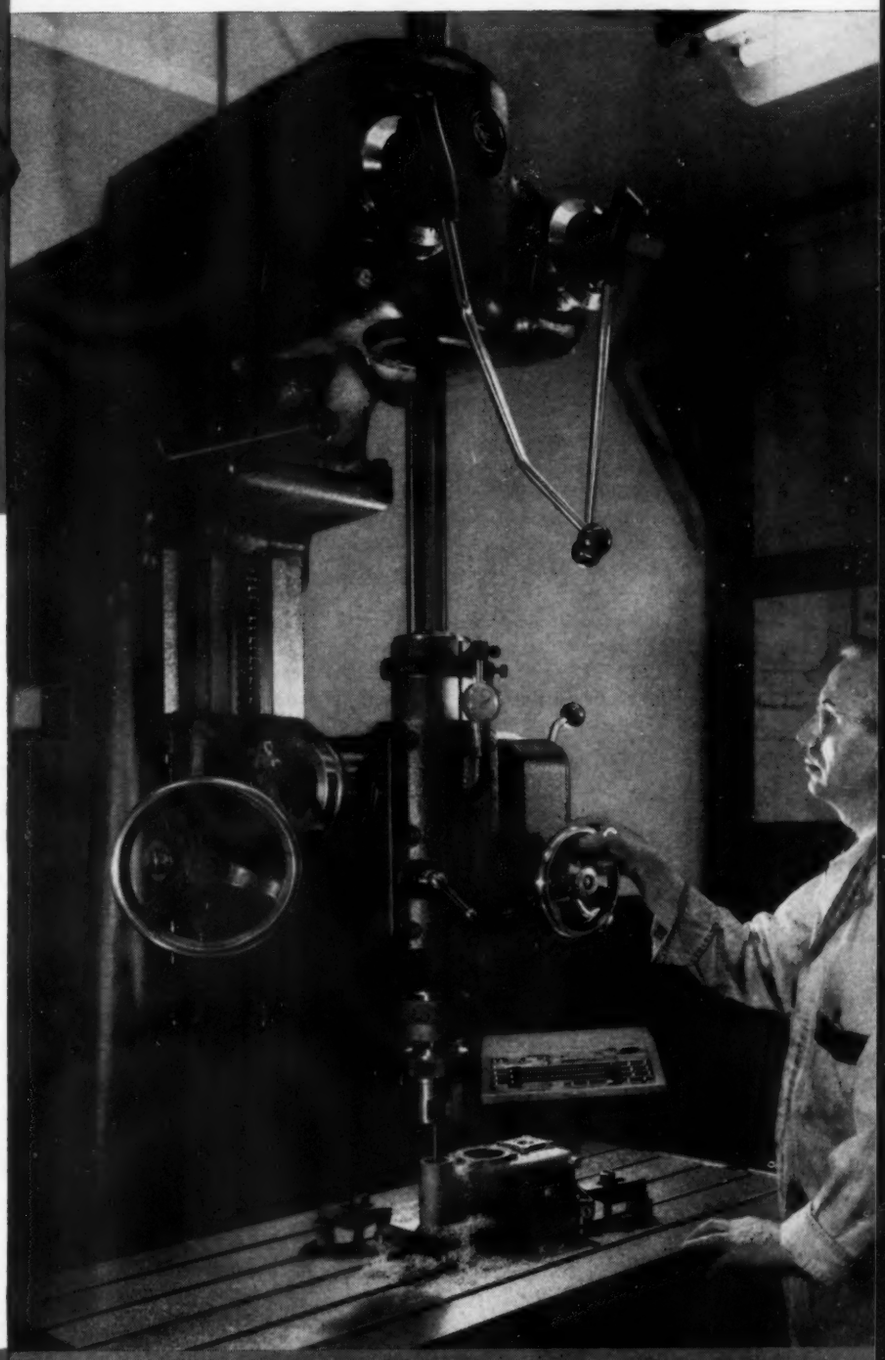
OPEN-BACK—INCLINABLE

PRESSES

SMALL LOT PRODUCTION—
ANOTHER ADVANTAGE OF

CLEEREMAN

JIG BORERS



Here is another example of the double utility of Cleereman Jig Borers—production of jigs, fixtures, tools and dies to the highest degree of precision, and the economical manufacture of parts in small quantities.

Shown above is one of a lot of several hundred magnesium castings machined by the M. P. Heinze Machine Company, Chicago. Precision boring of the three holes was performed on a Cleereman Jig Borer without recourse to jigs, fixtures, or previous layout. Location of the holes in relation to each other is limited to $\pm 0.0005''$, and the limit on hole diameter is $-0.0003''$ -0. This job was completed speedily and every dimension was within the specified tolerance.

Write

for catalogs on Cleereman Jig Borers and Cleereman Drilling Machines!

BRYANT
Machinery & Engineering
▪ Company ▪

General Office
400 West Madison Street, Chicago 6
Representatives In Principal Cities

Cleereman Machine Tool Co. of Green Bay, Wisconsin, organized in 1908 and affiliated with Bryant Machinery & Engineering Company, manufactures fine machine tools including Cleereman Precision Jig Borers and Cleereman Drilling Machines.

Have You These COST CUTTERS in Your Plant?

Machines That Need No Power

● The above Foot-Powered Squaring Shear is Famco's latest machine that needs no power. It's an all around "saver": original investment is small, no electric power is needed, it's simple to install, gauge settings are easy. A Famco shear will cut up to 18 gauge mild steel—it is finely balanced to do precision shearing—by just the push of a foot. It is ruggedly constructed of semi-steel, accurately machined; compression springs are encased against breakage. The Famco Squaring Shear is made in five sizes: 22", 30", 36", 42" and 52" cutting widths. All models are equipped with front, back and side gauges. The 36", 42" and 52" sizes come with "hold-down" attachment. The 30" size can be furnished with this feature at additional cost.

ARBOR PRESSES

UP TO 15 TONS PRESSURE

Famco Arbor Presses are easy to use, come in 32 models, bench and floor mounting . . . will deliver up to 15 tons pressure, yet require no electric power. They're portable and are just the thing to do all sorts of assembly and dismantling jobs.

SAVE ON LIGHT PUNCHING JOBS

Famco Foot Presses are another means for speeding up production on a wide variety of light punching and forming jobs. They're "waste savers" too—easily operated with speed and accuracy, they hold worker fatigue to a minimum. The Famco Foot Press is available in 10 sturdy models for bench or floor mounting.

FOOT PRESSES

All-in-all, Famco "Cost-Cutting" Machines add up to big savings for you. Ask your Famco dealer which Famco machines will best meet your requirements. Write for folder and price list.

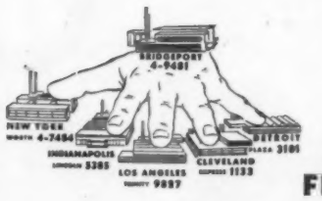
FAMCO MACHINE CO. • 1316 18th St. • RracINE, WIS.

famco COST CUTTING **machines**

SQUARING SHEARS • ARBOR PRESSES • FOOT PRESSES

PRODUCTO PRODUCTO PRODUCTO PRODUCTO

DIE SET *Service*



AT YOUR FINGER TIPS

Six strategically located plants listed above, are always at your service for prompt shipment and quick servicing of Producto Die Sets.

Full line of Producto Dowel Pins and other Die Makers' accessories are at all times in stock at these plants and also at Sales Offices in Buffalo, Syracuse, Philadelphia and Dayton.

To make full use of this real Coast-to-Coast Service set-up, you should have Producto Die Set Catalog No. 9. Write for it today, and remember . . .

"Your telephone is our Serviceman"

We also manufacture Producto Modern Machine Vises and Shop Tools, and are Distributors of Dickerman Automatic Press Feeds.

CALL

THE **PRODUCTO** MACHINE COMPANY
BRIDGEPORT 1, 998 HOUSATONIC AVE.

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3017 MEDBURY

LOS ANGELES, 21
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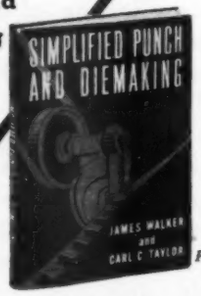
7 days'
FREE
examination

Step-by-step instruction in modern punch and diemaking, including valuable new methods and materials, by men widely experienced in toolmaking.



254 illus.
Full tables, glossary

Each step in the design and construction of all types of dies and punches for fabricating sheet metal is clearly explained. Full information about tools and materials for those who are inexperienced in diemaking. Much valuable *new* information, not heretofore published, on improved methods and materials. Entirely practical, specific, up-to-date. $5.

Use this coupon to get copy for FREE examination

The Macmillan Company, 60 Fifth Ave., New York 11

Please send me a copy of SIMPLIFIED PUNCH & DIEMAKING by Walker & Taylor @ $5, with the privilege of returning it within 7 days without charge.

Signed.....

Address.....

(please give postal zone no. if you have one)

HERE'S ONE FOR Your SUGGESTION BOX!
SUGGESTION CARD
We could cut costs by using Masonite Die Stock in fabricating our Sheet Metals
NAME John Smith

John has a good idea, there! And a logical one, too. For he knows that his firm can put the unique qualities of Masonite* Die Stock to good use.

You see, John worked in a bomber plant during the war. He remembers how extensively Die Stock was used to help meet high production quotas. He recalls the great number of dies, jigs, templates, fixtures and spinning chucks made of this lightweight semi-plastic. And he knows that the aircraft industry is today using even more Die Stock per plane than it used during the war.

Whenever *you* are tooling up for the fabrication of sheet metals—especially copper, brass, steel and aluminum or magnesium alloys—you'll find a willing helper in Masonite Die Stock. Many firms are using Die Stock for experimental tooling, and in making mock-ups and experimental models.

Dense, smooth and grainless, it won't check, split, shrink or twist. It is easily processed by high-speed equipment in wood or metal shop—cuts down on tooling-up time. Its lower initial cost is another money-saving factor. Masonite Die Stock is available in thicknesses of ¼ to 2 inches (easily laminated to greater thicknesses) and comes in sheets 48x72 and 48x144 inches. Send the coupon for complete information.

• • •

PRODUCTION PIN-UPS. Look for the next issue on your plant's bulletin board. Study the pictures and explanations of the latest uses of Masonite Die Stock.

*"Masonite" is a trade-mark registered in the U. S. Pat. Off., and signifies that Masonite Corporation is the source of the product.

Masonite BRAND DIE STOCK

Product of the State of Mississippi

MASONITE CORPORATION, Dept. AM-3, 111 West Washington Street, Chicago 2, Illinois
Please send me illustrative literature and complete information about Masonite Die Stock.

Name and firm .....

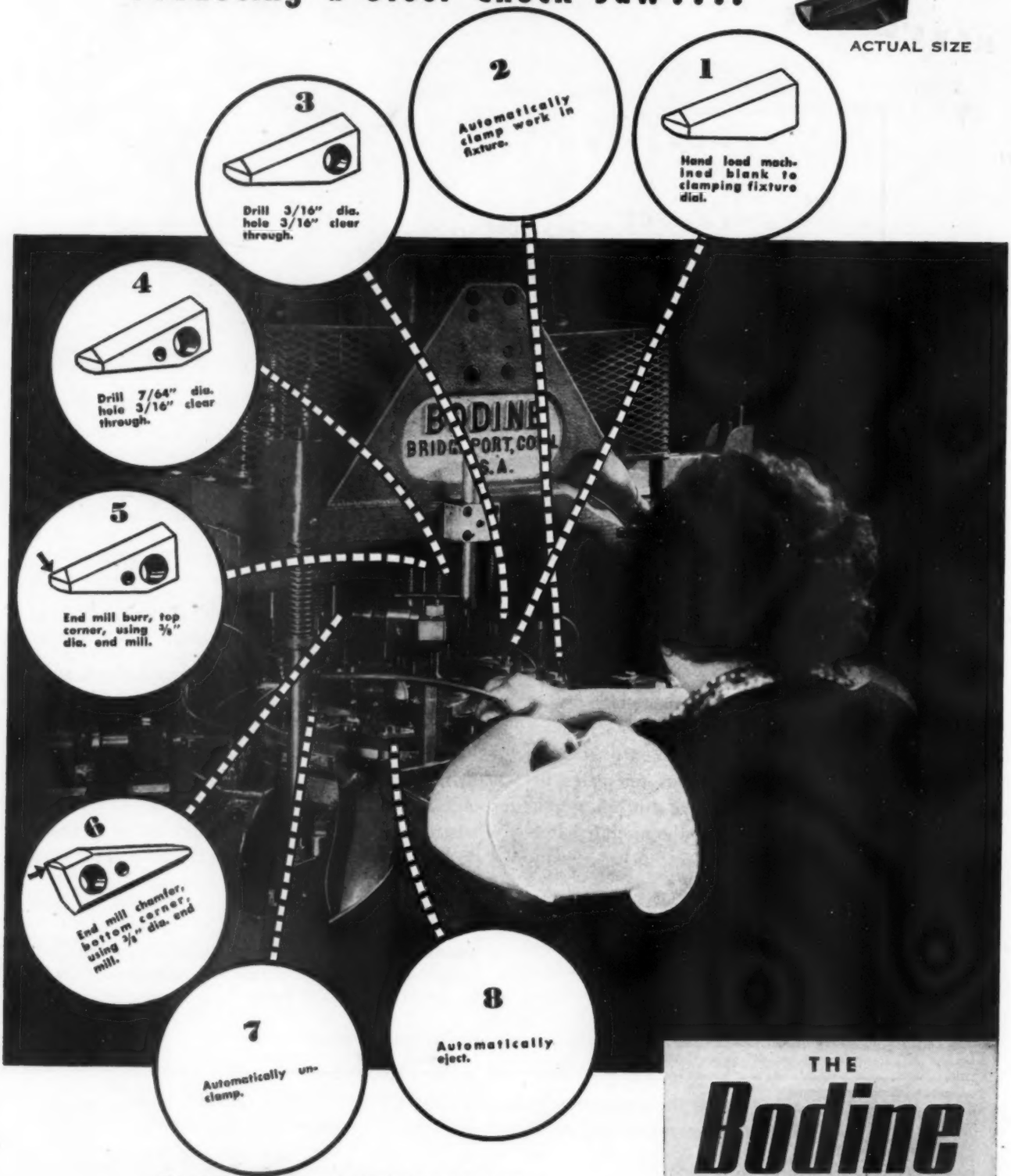
Address .....

City ..... *Zone* ..... *State* .....

Bodine...Case History No. 15

Producing a Steel Chuck Jaw....

ACTUAL SIZE



This Bodine automatic Multi-spindle, horizontal dial machine is producing 550 pieces per 50 min. hour at one piece per stroke of the machine at the Jacobs Mfg. Co., Hartford, Conn. It can do a similar job for you.

THE **Bodine** CORPORATION

BRIDGEPORT 5, CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

APOSTLE OF PRODUCTION

Steel has been made for many centuries prior to Henry Bessemer's work, but processes were painfully slow and prices prohibitively high. As a result, the steel industry was small and employed but few people.

When the Bessemer Converter reduced steel making time from six weeks to less than one hour, steel became available for the most commonplace use. Thus production's fundamental law was demonstrated . . . that speed in manufacture gives lower cost and therefore greater product use.

This law is still fundamentally sound and Clearing Presses provide another good demonstration. In hundreds of plants today, Clearing Presses are helping to provide finished products faster with greater accuracy and at lower cost. You are invited to consult with Clearing engineers at any time, whether your problem be faster production to decrease unit cost or new methods to improve quality or appearance.

Clearing presses are good examples of modern machines that help to produce more and better metal parts at lower cost than ever before.

CLEARING MACHINE CORPORATION
6499 West 65th Street, Chicago 38, Illinois

700-Ton Clearing Hydraulic

This 700-ton capacity Clearing Hydraulic Press will soon be on a production line helping to fill America's need for peacetime products. Typical of Clearing's service, the design of this press began with a complete analysis of the user's production requirements in terms of parts to be made and volume desired. This Press has a maximum stroke of 48", shut height of 76", bed area 60" x 144", and capacity of 700 tons. Write for Clearing Press information and recommendations based on your production needs.

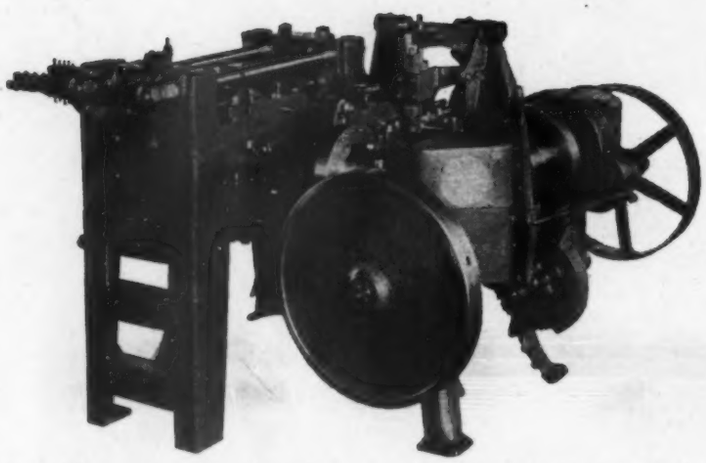
CLEARING MECHANICAL AND HYDRAULIC PRESSES

FOR DRAWING • BLANKING • FORMING • FORGING

CMC CLEARING

HANDLE YOUR SWAGING, STAMPING, PIERCING, BLANKING and FORMING of COILED METAL

ON THE **NEW NILSON AUTOMATIC PRESS and FOUR SLIDE MACHINES**



These Nilson machines are built in two sizes and are fully described in Bulletin No. 90, available promptly on request.

. . . for fast, heavy duty work

An outstanding feature of these combination power press and four slide machines is the powerful, silent action of the main press slide which is operated by crank motion through toggle or knuckle joints. Overhead stay rods contribute to the tremendous strength and rigidity of this machine.

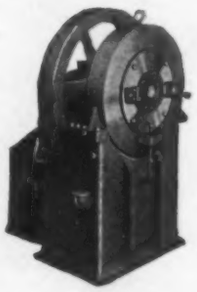
Other features include simple and easy changing of accessible and removable die set, open construction of forming slides and tool adjustments made without interference.

•

Nilson's more than 30-year experience in the design, development and manufacture of special, high production automatic machinery is available to assist you in producing any special machines you may require. Consult our engineers and be assured of a comprehensive service.

•

THE A. H. NILSON MACHINE CO. . . . *Bridgeport, Conn., U.S.A.*



THE
TORRINGTON
ROTARY
SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

The Torrington Co., Swager Dept.
56 Field Street — Torrington, Conn.

BAUMBACH
STANDARDIZED
DIE SETS

BETTER-MADE
DIE SETS
AT LOWER COST

46 Styles—195,000 Sizes

E. A. BAUMBACH MFG. CO.
Machined Steel — Semi-Steel
Send for our new catalog
1812 South Kilbourn Ave., Chicago, Ill.

PRESSES
FEEDS
AUTOMATIC EQUIPMENT
THE V&O Press Co.
HUDSON N Y

Talk About PRODUCTION Without DIES!

Send for Catalog . . . showing DI-ACRO Precision Machines and many examples of parts made with "DIE-LESS DUPLICATING."

Pronounced "DIE-ACK-RO"

4,000 Parts Per Day With DI-ACRO Bender

Here is an example of "DIE-LESS DUPLICATING" typical of a great variety of formed parts readily made with DI-ACRO Precision Machines,—Benders, Brakes, Shears. Picture shows the finished part formed to die precision, including acute right angle bend. Women operating DI-ACRO units maintain a high out-put on production work.

"Enclosed picture in our plant proves the DI-ACRO Bender will do a real production job. We are making 4,000 completed parts per day which is competitive to most Power Presses." (Name on request.)

DI-ACRO BENDER No. 1 ★

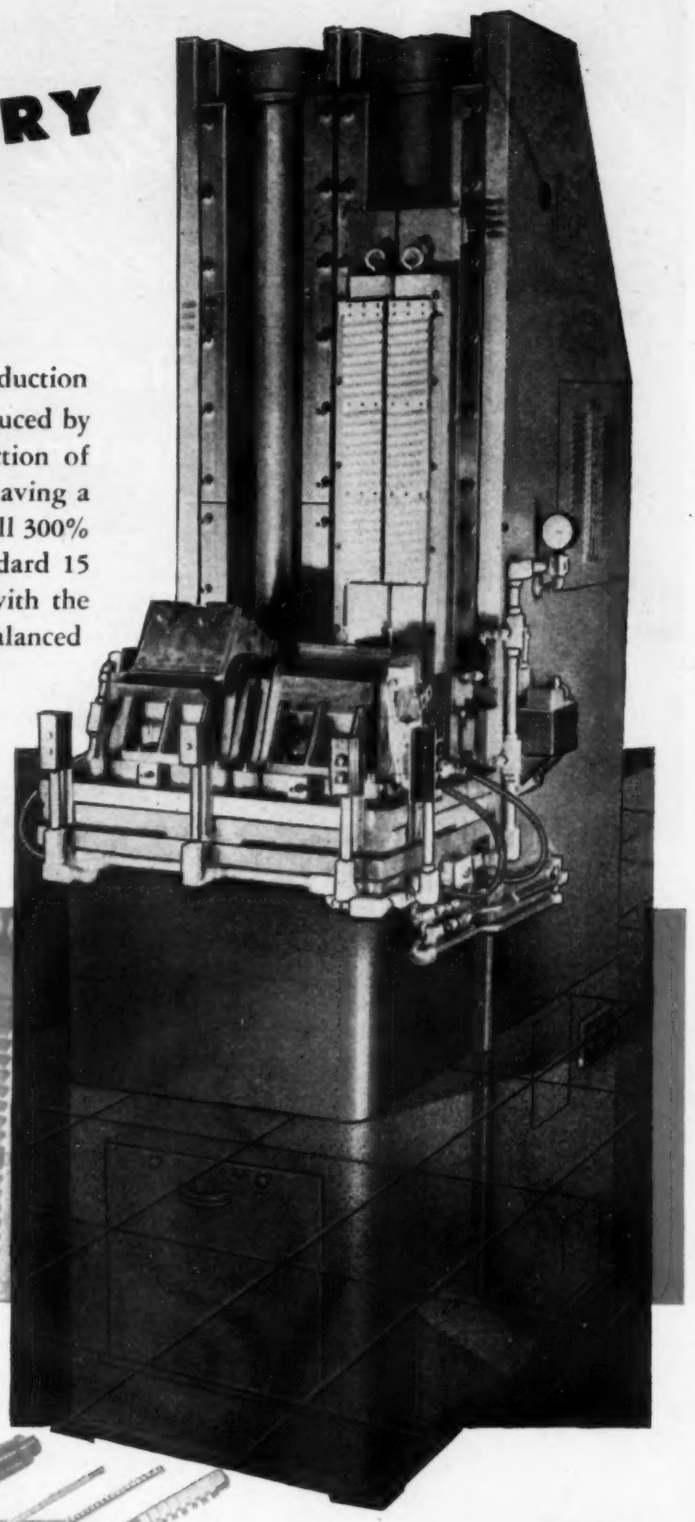
DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO. 311 EIGHTH AVE. SOUTH • MINNEAPOLIS 15, MINN.

POSTWAR SUCCESS STORY ...1946

IRONING out old-fashioned production wrinkles is a habit at Lapointe! Formerly produced by milling and grinding methods, actual production of these close grained cast iron flatiron bases — having a Brinell hardness of 230-250 — has jumped a full 300% per man hour. An ingenious fixture on a standard 15 ton 66″ stroke double-ram vertical machine, with the ram hydraulically synchronized and counterbalanced allows the operator to load, broach and unload *both* sides of the base concurrently — without moving from his station. RESULT? Tripled production — lower unit cost — closer tolerances within 50 micro inch finish!

Standard 15 ton 66″ stroke DRV, with special tip up fixture, producing 220 complete base plates per hour — for a total of 440 broaching operations.



THE Lapointe MACHINE TOOL COMPANY
HUDSON, MASSACHUSETTS • U.S.A.

If you plan for tomorrow — consult Lapointe today! A Lapointe designed machine will "iron out" *your* production problems and help you to make things Quicker, Cheaper, and Better . . . by broaching! Write Dept. 310.

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

Recondition your old machine tools

to obtain maximum efficiency for meeting modern demands

GENERAL MACHINERY PLANT AT HAMILTON, OHIO

We have complete records and shop facilities for repairing and servicing the following makes of machine tools.

- Bement Miles & Co., Philadelphia, Pa.
- Ridgway Machine Co., Ridgway, Pa.
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- David W. Pond Co., Worcester, Mass.
- Detrick & Harvey Co., Baltimore, Md.
- Putman Machine Co., Fitchburg, Mass.
- Niles Tool Works Co., Hamilton, Ohio

Experienced men are available for field service

GENERAL MACHINERY CORPORATION
HAMILTON, OHIO

REPRESENTED THROUGHOUT LATIN AMERICA BY MACHINE AFFILIATES, INC.

THE NILES TOOL WORKS CO. ★ THE HOOVEN, OWENS, RENTSCHLER CO.

It's not a MONA LISA...

But... We do take pride in the oil painting by A. S. Finlayson, presented to the Manchester Art Gallery in Manchester, England by Ford Motor Co. Ltd.

This painting shows how BAUSH W-7 Multiple Spindle Drilling Machines speeded vital production of airplane engines for Great Britain's defense. Three BAUSH machines are performing multiple progressive production operations on Rolls-Royce Aero Motors at Ford Motors Ltd., England.

Machine at right is trepanning 12 intake and 12 exhaust valve seat inserts — center machine rough bores and chamfers — machine at left finish bores and chamfers. Valve guide inserts act as tool pilots in all 3 operations.

It is typical of Baush Machine Tool installations where multiple *drilling, boring, tapping and reaming* operations, consolidated into one machine operation, are showing manufacturers greater profit through faster and more economical production.

BAUSH

MACHINE TOOL CO.

SPRINGFIELD 7, MASSACHUSETTS

MOREY *Universal* TURRET LATHES
for BAR or CHUCKING

THE TURRET LATHE *Your Operator* APPROVES!

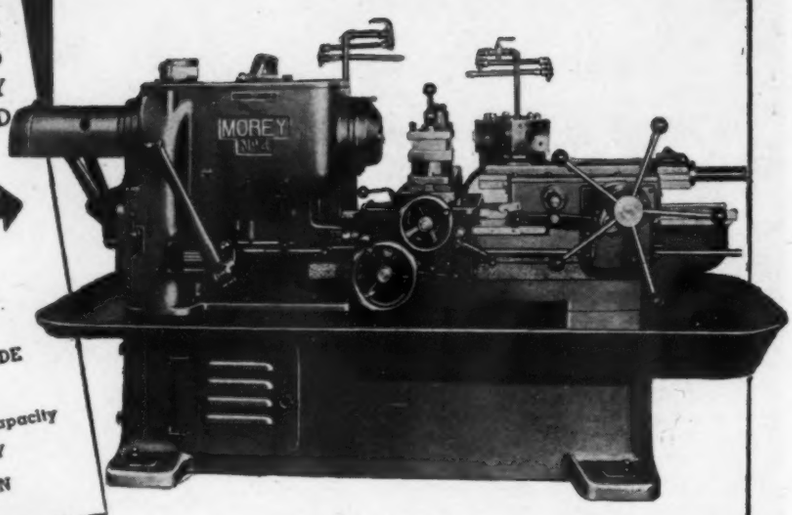
EASY TO OPERATE • ACCURATE
DEPENDABLE • RIGID AND
POWERFUL ENOUGH TO FULLY
UTILIZE PRESENT-DAY HIGHSPEED
CARBIDE TOOLS

#4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length 19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM.
constant speed motor, 1200 RPM
MAY BE HAD WITH PLAIN CROSS SLIDE

Also available in
No. 3 Universal, 1½" capacity
No. 2 Plain, 1" capacity

ASK FOR DESCRIPTIVE BULLETIN

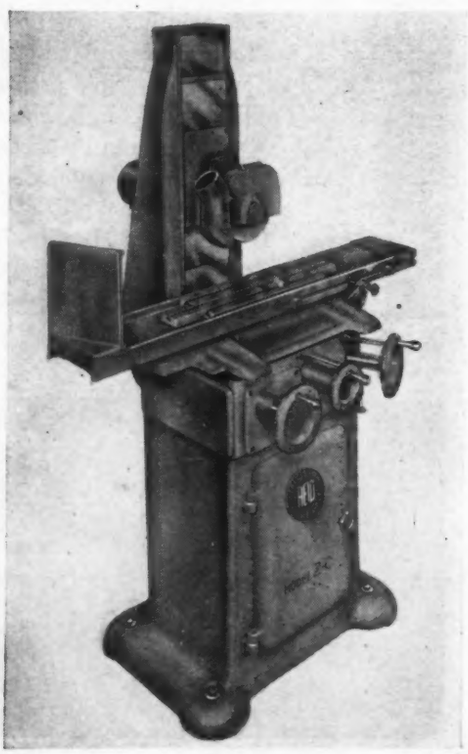


STOCK DELIVERY

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC 410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

PRECISION REID SURFACE GRINDERS

EFFICIENT SURFACE GRINDING ADDS THE FINISHING TOUCH TO PERFECTION



These REID Features Assure that Result

Head Elevating Wheel on Apron • Brake on Elevating Hand Wheel • Silent Chain Drive on Table • Ball-Bearing Drive Cross Shaft • Oil Rolls on Table and Cross Slide for Even Distribution • Adjustable Dust Collector Spout • Sturdy, Vibrationless Structure

Illustrated is Model 2-C Reid Hand-Feed Surface Grinder. This machine is highly recommended for close tool, gage and die work and certain production grinding.

EXCELLENT DELIVERIES
Distributors Conveniently Located in All Sections.
Write Dept. "H" for Bulletin and Prices.

REID BROTHERS COMPANY, INC.
BEVERLY MASSACHUSETTS

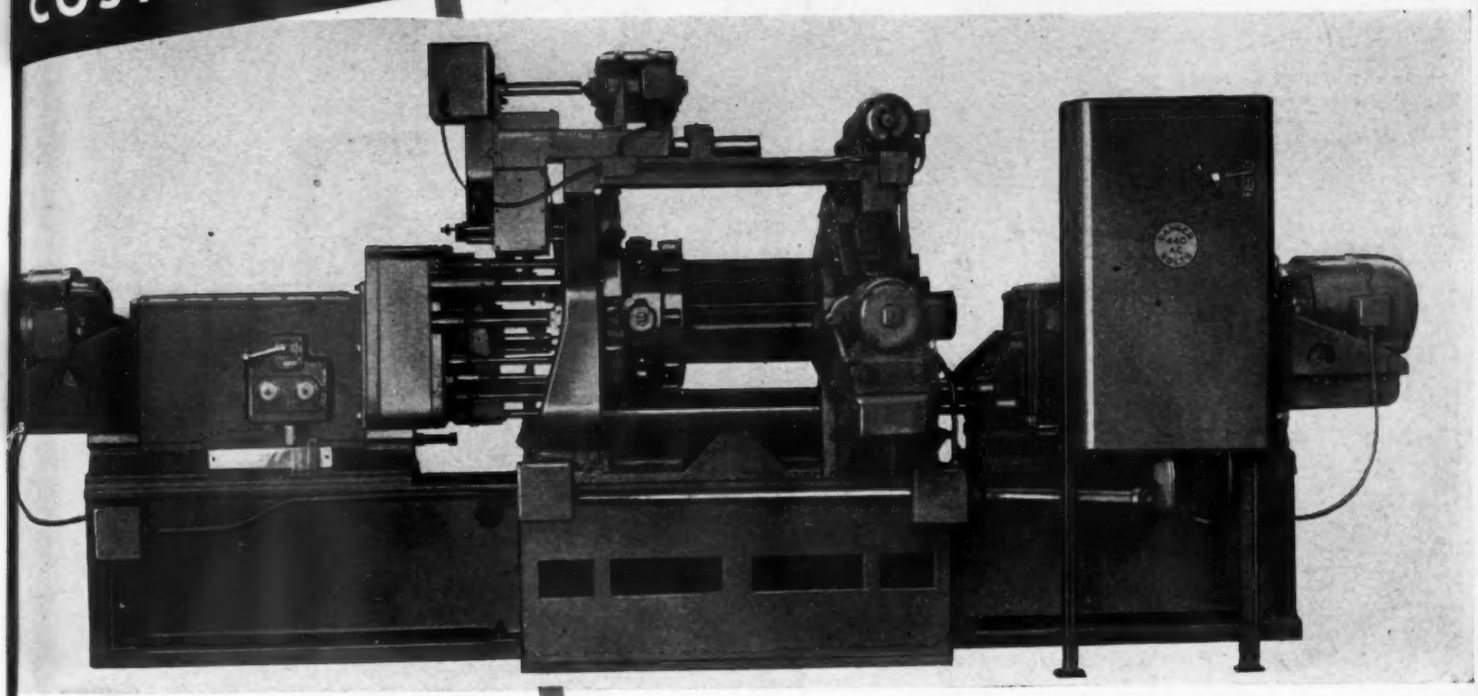
Baker Flexibility CAN CUT YOUR PRODUCTION COSTS, TOO!

"Productivity can be increased only by the increasing utilization of machines which enable the worker to multiply his own output. We can increase employment in this country only in proportion to production."*

What does this mean to you? Only that the future of our present economic system depends on the use of more and more efficient machines . . . machines that make it possible for the individual worker to produce *more* in *less* time. This, because it reduces unit cost, creates a wider market and proportionately larger demand. The result is a need for larger volume of production and the creation of more jobs. Clearly *jobs are created by giving the worker machines with which he can do more and better work.*

To this end, BAKER has developed many productive type machines which, while they do not eliminate the human element, *do* aid the operator in increasing his production and turning out more accurate and higher quality work. The operator of a machine should not be taxed beyond his fatigue limit—and BAKER automatic cycle machines are designed to relieve the operator of as much physical effort as possible, thus permitting him to do a faster and more efficient job.

Get in touch with BAKER *now*. Let us demonstrate the cost-reducing, job-creating possibilities of BAKER machines.



The BAKER unit illustrated above—a 7½ AA14 hydraulic-feed unit type two-way machine with trunnion type rotary fixture—was completely tooled by BAKER to drill, counterbore and ream steel forged camshafts. The machine is completely automatic and is started in cycle by means of a pushbutton station placed convenient to the operators position. This BAKER is furnished with Vickers variable delivery pump which required a minimum of power—thus leaving 70 to 80% of total horsepower of the main drive motor for operation of tools.

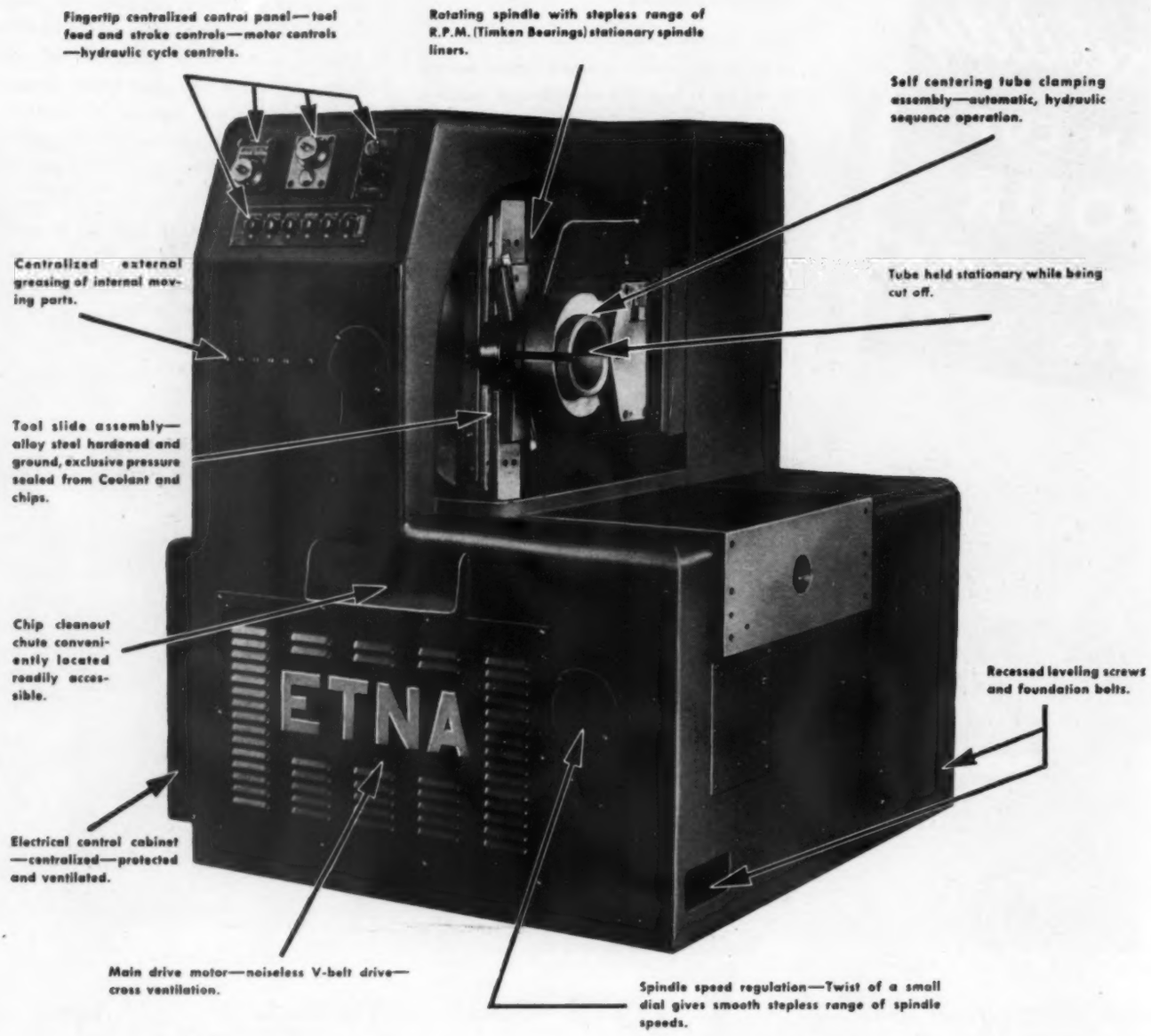
BAKER BROS., INC.
Toledo Ohio
Manufacturers of Drilling, Boring and Tapping Machines

HOW?

By making it easier for the operator to produce more in less time with less effort!

THE TUBE REMAINS STATIONARY...

IT'S THE CUTTER HEAD THAT ROTATES


Fingertip centralized control panel—tool feed and stroke controls—motor controls—hydraulic cycle controls.
Rotating spindle with stepless range of R.P.M. (Timken Bearings) stationary spindle liners.
Self centering tube clamping assembly—automatic, hydraulic sequence operation.
Centralized external greasing of internal moving parts.
Tube held stationary while being cut off.
Tool slide assembly—alloy steel hardened and ground, exclusive pressure sealed from Coolant and chips.
Chip cleanout chute conveniently located readily accessible.
Recessed leveling screws and foundation bolts.
ETNA
Electrical control cabinet—centralized—protected and ventilated.
Main drive motor—noiseless V-belt drive—cross ventilation.
Spindle speed regulation—Twist of a small dial gives smooth stepless range of spindle speeds.

ETNA *Tube Cutoff Machine*

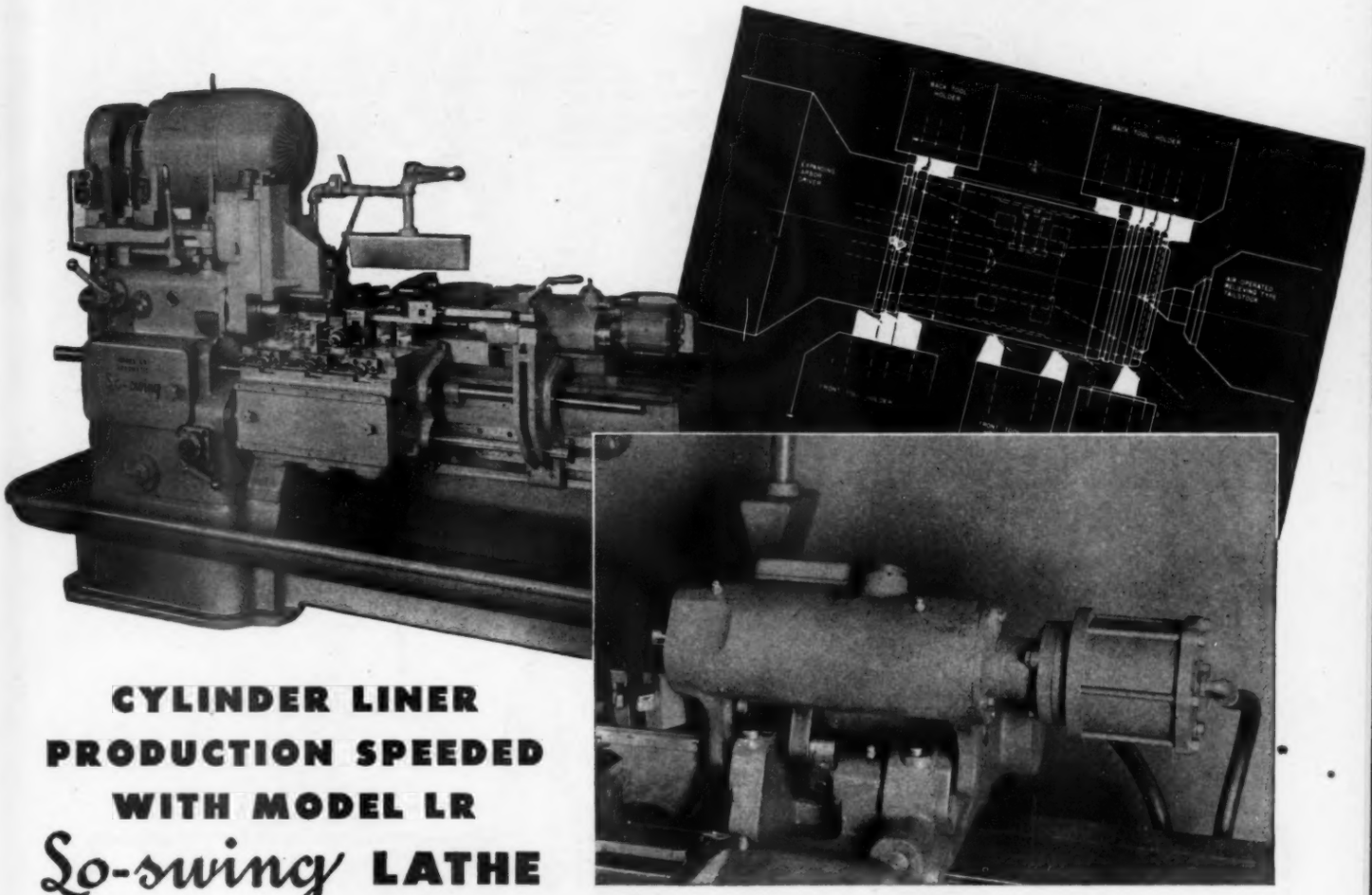
• Choice of Hydraulically or Electrically operated Feeding Devices • Precision gaging for length to be cut • Fully automatic or semi-automatic cut-off and Feed Cycle operation • Push button Feed Controls • Automatic lubrication of feedways.

Catalog sent on request.

THE ETNA MACHINE CO., TOLEDO 10, OHIO

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



CYLINDER LINER PRODUCTION SPEEDED WITH MODEL LR Lo-swing LATHE

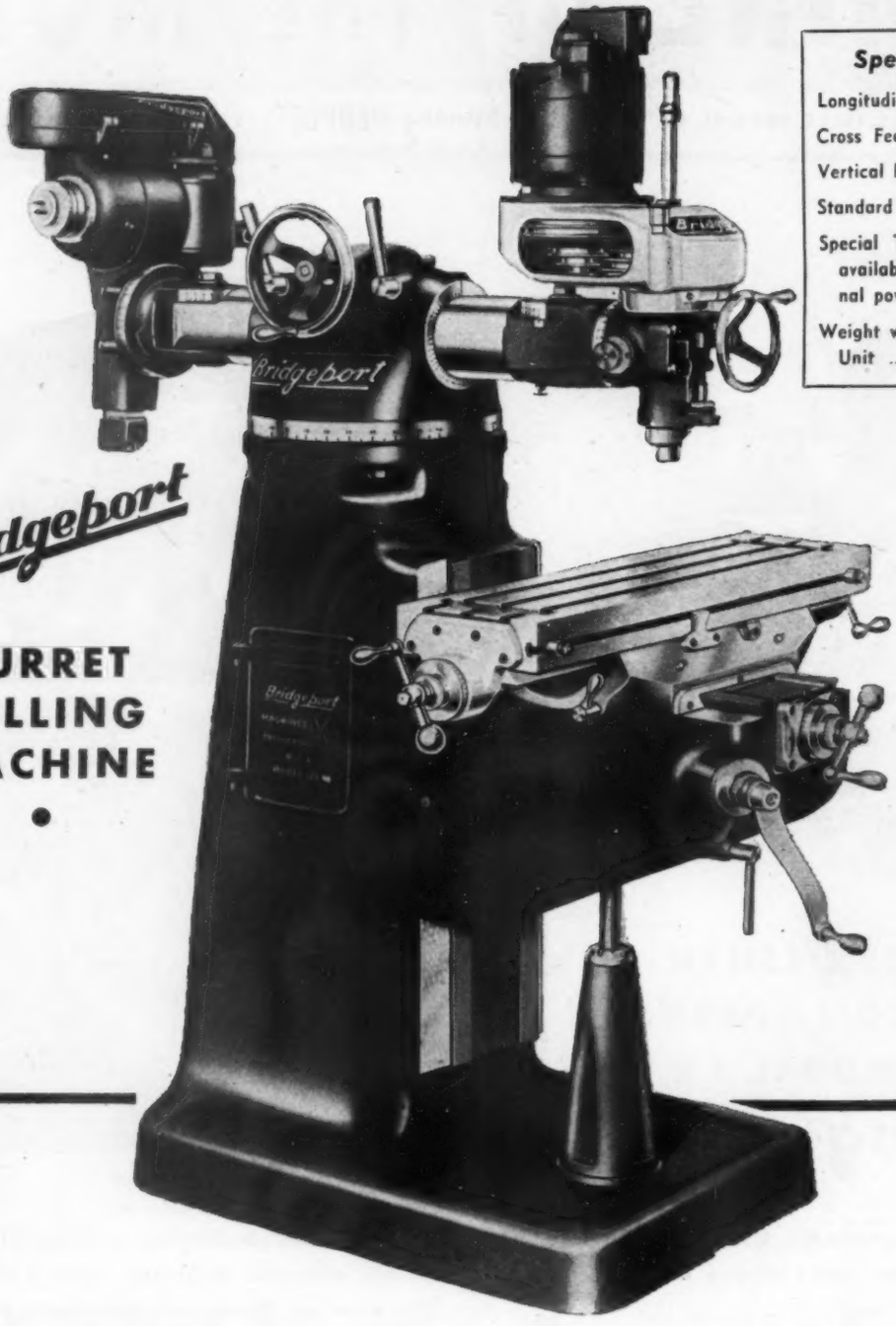
PROBLEM: To automatically turn outside diameters, face and groove cast iron Cylinder Liners of various types with Carbide Tools.

SOLUTION: The Model LR Automatic Lo-swing Lathe, was selected for the following reasons: (1) demonstrated fine performance with carbide tools; (2) ease of setting-up with its SIMPLIFIED CHANGE-OVER MECHANISM; and (3) ease of loading and unloading with the RELIEVING TAILSTOCK which also reduces overhang of the tailstock spindle to a minimum.

The cast iron cylinder liners are delivered to the Lathe with the bore machined to size and the large end faced. They are held and driven with an air-operated, expanding collet arbor which extends the full length of the piece, thus assuring a large area of driving surface which permits high cutting speeds and coarse carriage feeds for fast production. Loading of the parts is simplified with the Relieving Type Tailstock, shown in the close-up illustration and since the driving arbor is bolted to the spindle nose, the operator is relieved of handling heavy stub arbors generally used when the parts are held between centers. The outside diameters and the short taper on the tailstock end of the liners are turned with six tools mounted on the front slides; all facing and grooving operations are accomplished with tools mounted on the rear slide. The entire operation is automatic—the operator simply loads and unloads the parts and pushes the starting button.

Seneca Falls engineers are always at your disposal to help find solutions for any of your difficult turning operations.

LATHE NEWS from SENECA FALLS



Specifications

Longitudinal Feed	20"
Cross Feed	9"
Vertical Feed of Knee	16"
Standard Table	9"x32"
Special Tables up to 48" available; also longitudinal power feed.	
Weight with Shaping Unit	2000#

Bridgeport

TURRET MILLING MACHINE

•

Outstanding savings in time and production costs are offered in Bridgeport Turret Milling Machines because design is such as to assure the maximum in versatility, speed, sturdiness and operating convenience. All these advantages are achieved in a single streamlined machine which will mill, drill, bore and shape with equal ease and precision *at all angles and without changing set-up.* The "Bridgeport" is a modern machine for immediate and future requirements.

Now is the time to investigate

The

Bridgeport

MACHINES, Inc.

Bridgeport, Conn.

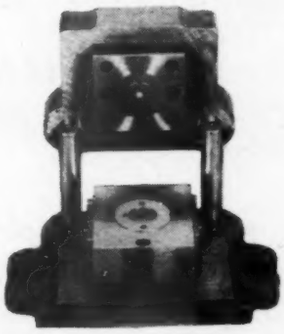
Eliminate

YOUR SPECIAL WASHER TROUBLES

WITH

HOVIS

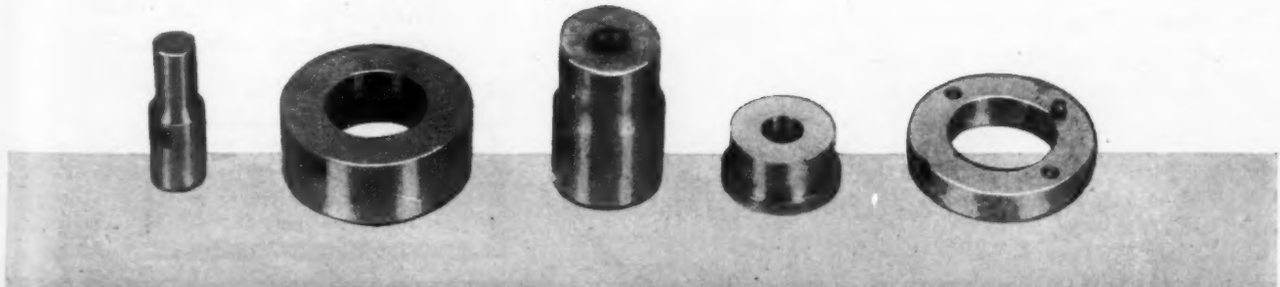
UNIVERSAL MASTER WASHER DIES



Made in 5 sizes:
¾"—1½"—2½"—4"—6".

MAKE washers the Hovis way, the method adopted by leading manufacturers. Save time and materials. Eliminate process engineering, tool designing and tool tryout. Make washers on short-notice as you need them . . . Once you have made a nominal investment in Hovis Master Dies (which do not become obsolete), all you need to change are the 5 SMALL INTERCHANGEABLE PARTS, shown below, to make a new size washer. The cost is ONLY $14.85, your TOTAL PERISHABLE COST for any washer less than ¾" diameter.

WRITE FOR LITERATURE



HOVIS SCREWLOCK COMPANY

8098 E. NINE-MILE ROAD — Suburb of Detroit Phone: Centerline 1575 — VAN DYKE, MICHIGAN

Finer Finishes at Roughing Speeds to *Meet Tomorrow's Competition . . . .*

LIPE *Carbo-Matic* LATHES

- **FEWER MAN HOURS** because it is entirely automatic.
- **FEWER MACHINE HOURS** because it is super-powered for speed.
- **FEWER REJECTS** because it is super-rigid for accuracy.

Finer and finer finishes at faster and faster speeds! Speed that is not lost through time lags in loading, unloading and operating—or through high scrap losses and rejects!

Those are competitive factors you'll have to reckon with tomorrow. And worn-out or over-age lathes won't face up to them. They'll cost you more in lost production, spoilage of product and poor workmanship than new Lipe Carbo-Matic Lathes will cost you.

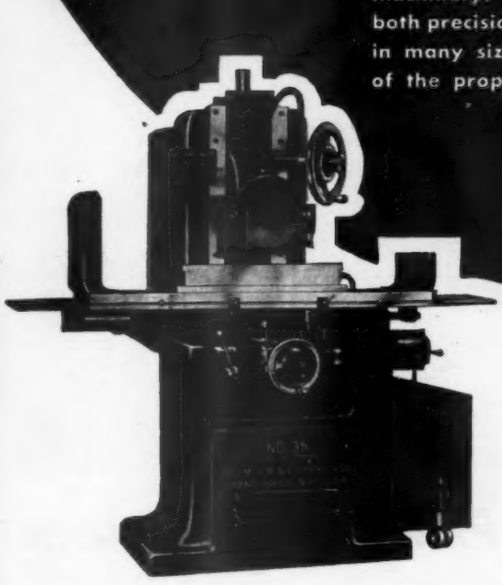
The Lipe Carbo-Matic was designed and built for carbide tools and for tight limits of finish and accuracy at roughing speeds. Super fast, rigid as a rock, its cone-worm gear and multiple V-belt drive gives a smooth, chatterless cut, hogging off metal to rough-grinding tolerances on the first pass. Fully automatic, even on complex cycles, it permits battery operation and reduces loading and unloading time to a minimum. A heavier base, over-size motor, accessible controls and other modern features make it the tool of tomorrow.

Write or wire for a Lipe engineer to call and explain to you how the Lipe Carbo-Matic will fit into your reconversion program.

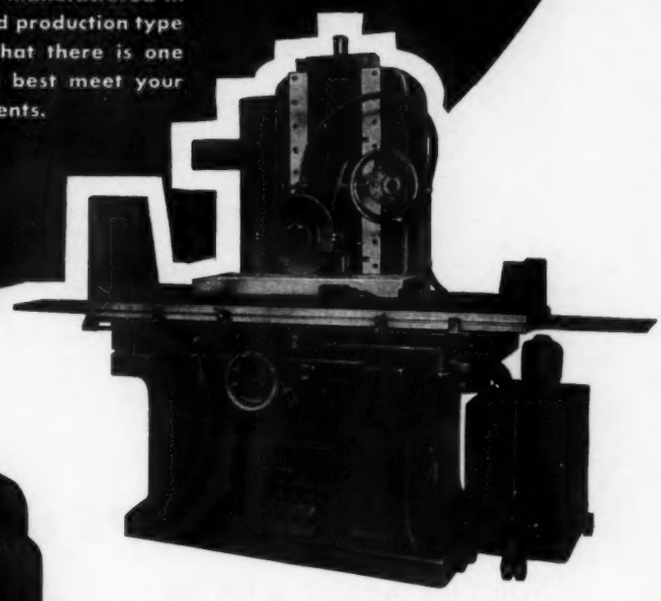
LIPE-ROLLWAY CORPORATION
Syracuse 5, N. Y.

GRAND RAPIDS
HYDRAULIC FEED SURFACE
Grinders

GALLMEYER & LIVINGSTON COMPANY is today building what is without question the finest, smoothest, and fastest Hydraulic Feed Surface Grinders of their entire career — a direct result of over 35 years of experience in the design and production of high grade precision grinding machinery. These machines are manufactured in both precision tool room type and production type in many sizes with the result that there is one of the proper size and type to best meet your particular requirements.



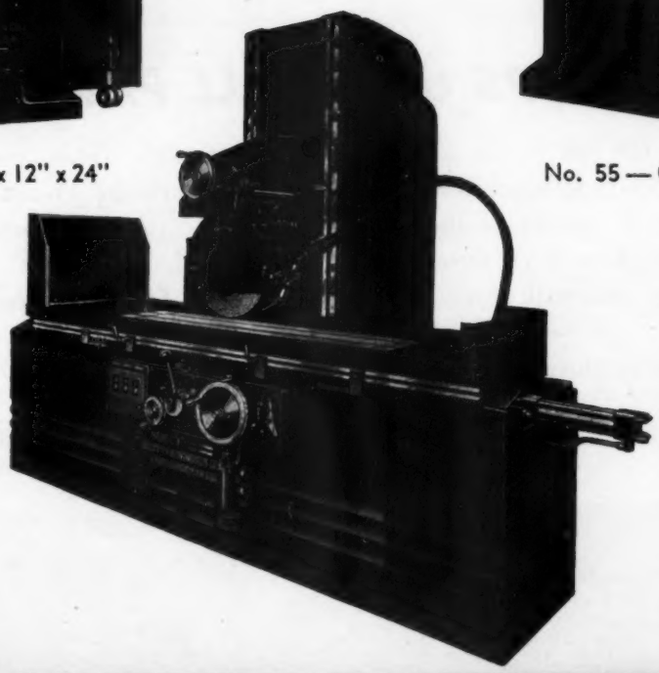
No. 35 — Capacity 8" x 12" x 24"



No. 55 — Capacity 12" x 17" x 36"

Precision Tool Room Type Machines

This is the type of GRAND RAPIDS Hydraulic Feed Surface Grinder on which one prominent machine tool builder obtains a 5 micro inch finish operating machine at 125 feet per minute. They are illustrated and described in bulletin GL-100.



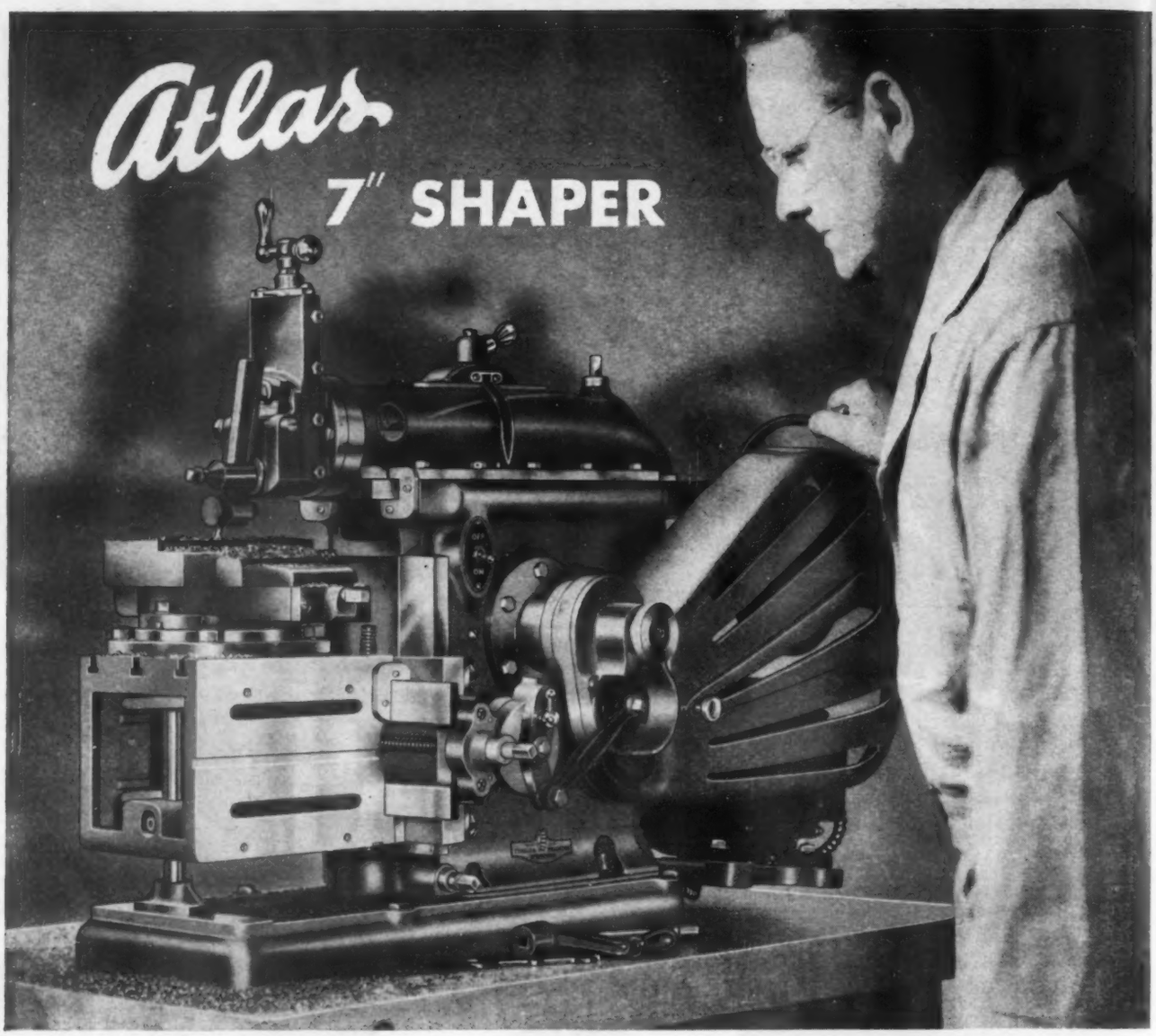
Production Machines

GRAND RAPIDS Production Type Hydraulic Feed Surface Grinders manufactured by the GALLMEYER & LIVINGSTON COMPANY are designated as Model F and Model A and feature the use of wide faced wheel and cross traveling head. GRAND RAPIDS Production Type Hydraulic Feed Surface Grinders are illustrated and described in bulletin GL-4-1-43. Write for your copy today.

GALLMEYER & LIVINGSTON CO.

330 STRAIGHT AVE. S.W.

GRAND RAPIDS, MICHIGAN



QUICKER SET-UPS on SMALL PARTS Operations

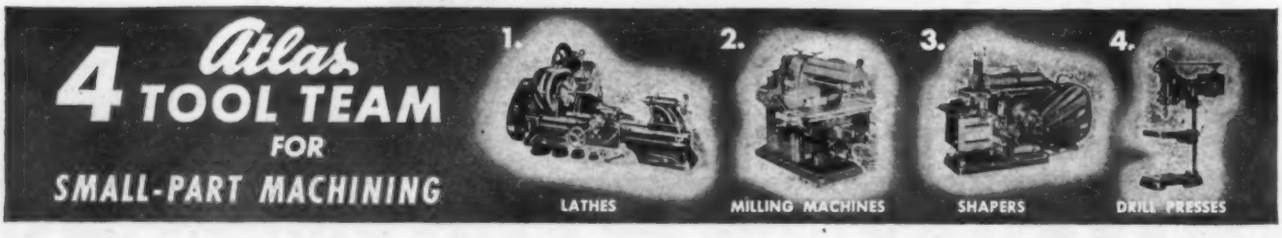
"Match the machine to the job" is an idea that is especially valuable in shaping operations. Most of them are within the 7" stroke of the Atlas shaper. You can save considerable on set-up time, machine hour and power costs with this compact, low cost tool.

The Atlas shaper handles close tolerance work to perfection. Gives you a selection of cutting strokes between 45 and 186 per minute, speeds from 3½ to 116 fpm. It is Timken bearing equipped. Operates from ½ HP motor.

Send for catalog with complete specifications and operating details.

ATLAS PRESS COMPANY

304 North Pitcher Street, Kalamazoo 13D, Michigan



CAMPBELL ABRASIVE CUTTING MACHINES ARE PRODUCTION MACHINES

CAMPBELL MAKES A FULL LINE OF ABRASIVE CUTTERS

Send for your copy of this file-size catalog folder. Ask for DH-1315.

Campbell machines have been developed far beyond the simple function of cutting off materials. The job shown above, for example, is but one of many in which abrasive cutting is supplanting other conventional machining methods—speeding up and economizing production. Write for detailed information.

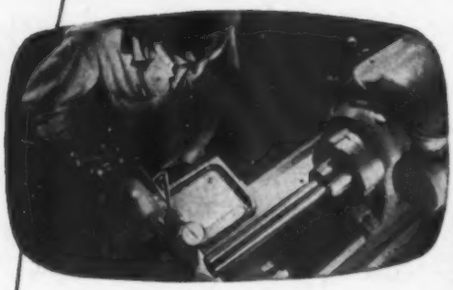
ACCO

TRADE MARK

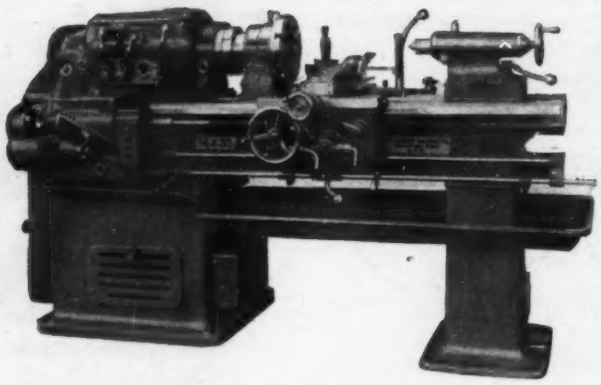
ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

ANDREW C. CAMPBELL DIVISION
AMERICAN CHAIN & CABLE • BRIDGEPORT, CONN.

Test...



Test...



14" 18-Speed Precision Tool Room Lathe with sub-headstock for cutting long leads. This attachment may be mounted or removed in a few minutes—a real tool room asset.

Test...

Testing of every dimension on every part, testing of every assembly, testing of every finished machine . . . these are some of the reasons for the precision that everyone expects *and gets* from every Hendey Tool Room Lathe. Add these to quality materials, advanced design, modern machining methods and finest craftsmanship, and you find the reason for Hendey leadership since 1870.

14" Hendey Tool Room Lathes are easy to operate, fast on production and precise for years. This lathe has an 18-speed headstock with a Lo-Range of 12 to 635 R.P.M. and a Hi-Range of 19 to 1,000 R.P.M. It has conveniently located, simplified controls. It is built to do a real job for you, and to save real money for you, on your tool room work. Write for catalog giving complete details.

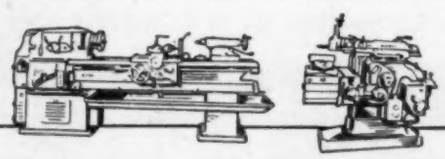
Test...

The Hendey Machine Company

Main Office and Plant — Torrington, Connecticut

Branch Offices — New York, Chicago, Boston, Detroit, and Rochester
Representatives in — Phila., Cleveland, Los Angeles, Pittsburgh, San Francisco

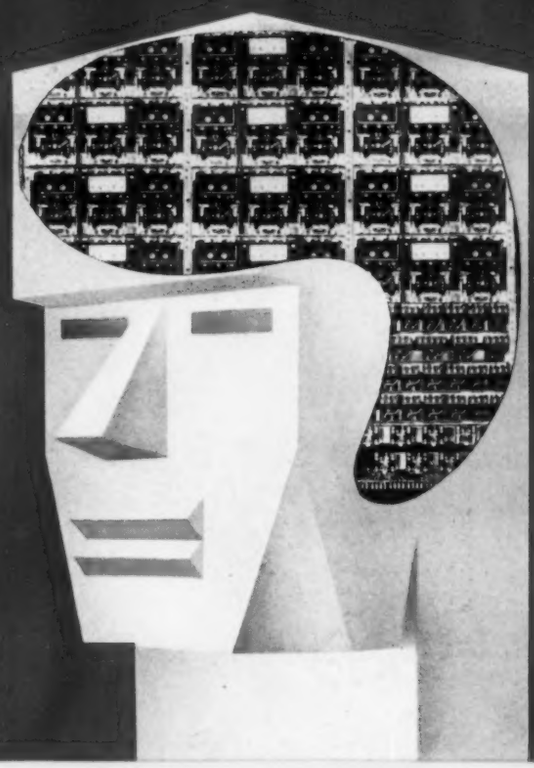
Hendey



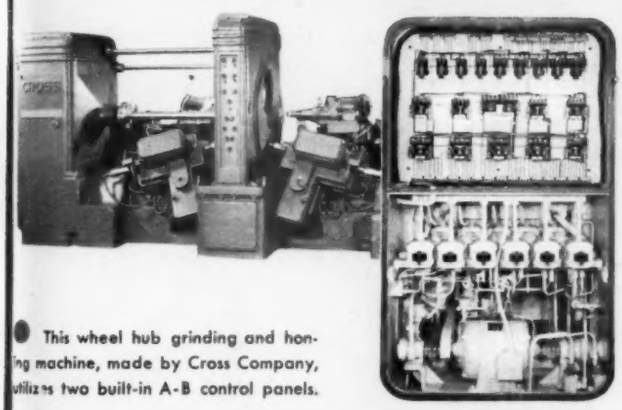
TOOL ROOM LATHES
12"-14"-16"-18"-20"-24"

SHAPERS
12"-16"-20"

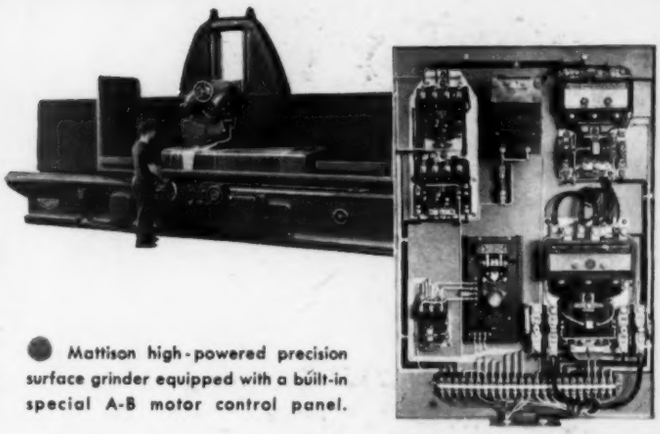
Install a Modern "Electric Brain" on Your Machines



The "Electric Brain" of the modern machine is the motor control panel. Simply push a button and the electric controls provide the correct automatic sequence operation—it speeds operations and minimizes errors. Allen-Bradley engineers will gladly study your control problems—usually the answer can be found in an assembly of standard control units. Write today!

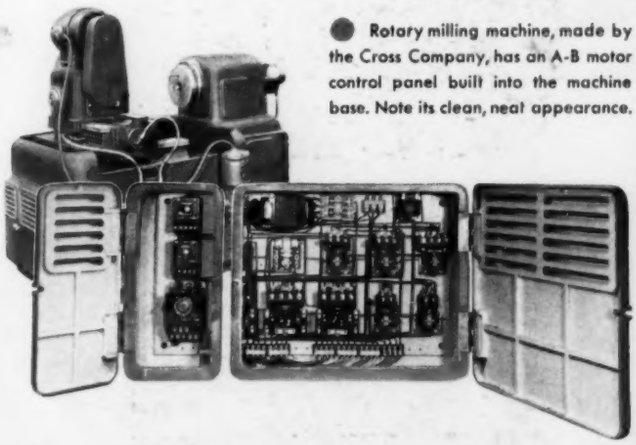


● This wheel hub grinding and honing machine, made by Cross Company, utilizes two built-in A-B control panels.



● Mattison high-powered precision surface grinder equipped with a built-in special A-B motor control panel.

● This line-bearing crankshaft lathe made by R. K. LeBlond and equipped with a special Allen-Bradley control panel provides an efficient layout.



● Rotary milling machine, made by the Cross Company, has an A-B motor control panel built into the machine base. Note its clean, neat appearance.

A-B Quality

Let ALLEN-BRADLEY QUALITY design your Special MOTOR CONTROL PANELS

It's the Moving Parts that Give Trouble

1 Moving Part—1 Chance for Trouble

2 Moving Parts—2 Chances for Trouble

4 Moving Parts—4 Chances for Trouble

20 Moving Parts—20 Chances for Trouble

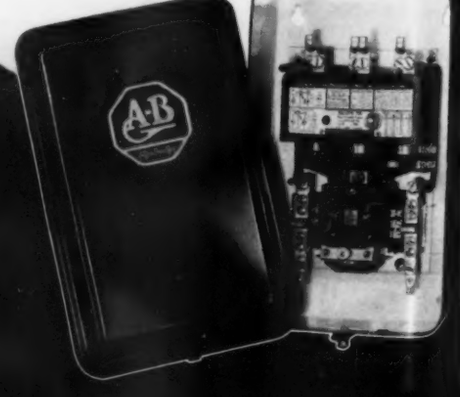
Only 1 Moving Part

in Allen-Bradley Solenoid Starters

It's the amazing simplicity of the Allen-Bradley solenoid starter that makes it so trouble-free. The only moving part is the simple plunger which carries the movable contacts. There are no pins, pivots, or bearings to corrode and stick . . . no flexible jumpers to break. And the double break, silver alloy contacts never need filing, cleaning, or dressing. With an Allen-Bradley solenoid starter you can get millions of trouble-free operations. Just install this starter . . . and forget it!

Allen-Bradley Company
1316 South Second Street, Milwaukee 4, Wis.

Right—Bulletin 709 across-the-line solenoid starter. Note its attractive appearance, white cabinet interior, and generous wiring space.

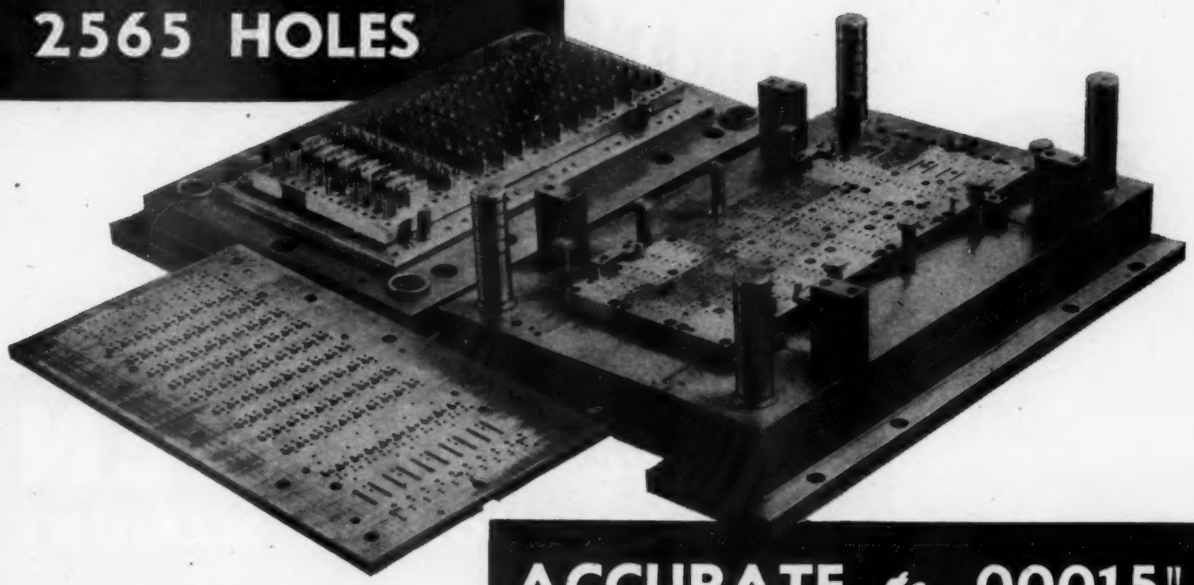


ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

QUALITY

2565 HOLES

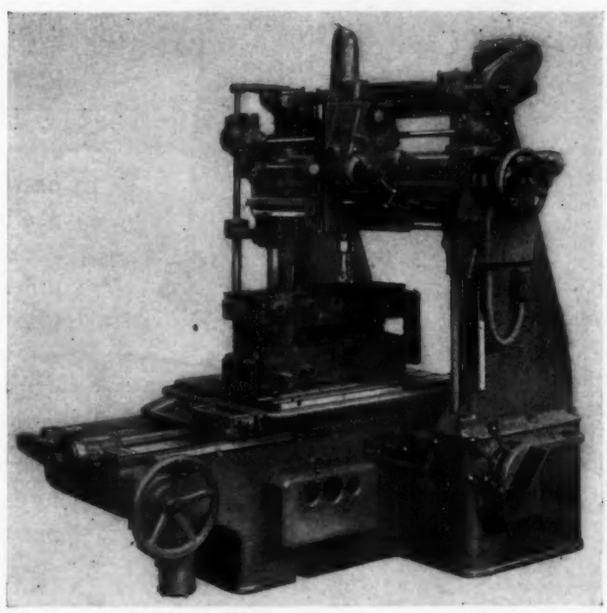


ACCURATE *to* .00015"

...try and match this SIP *precision on your machine!*

A SIP Jig Borer is used for this exacting job—drilling 2565 accurately spaced holes in a die, punch and stripper plate . . . And the SIP Jig Borer checks its own accuracy, for this machine is in itself a basic measuring instrument, a standard of precision to which all other shop measurements can be related. The built-in micrometer heads give direct readings to 0.00005 inches. By using the system of rectangular coordinates, work can be set up and holes located without any preliminary laying out. Time wasted using separate measuring instruments, or making involved calculations, or checking results is entirely eliminated. *Can you match this speed and precision with your present jig boring equipment?*

For jigs and fixtures, for development work, for precision boring, drilling and milling . . . for all those jobs which demand the ultimate in accuracy . . . SIP Jig Borers are known for their speed, their high capacity, their convenience of operation and their precision. Five sizes of SIP Jig Borers are again available, and we can quote excellent deliveries. Write for catalogs describing the many mechanical refinements which make SIP Jig Borers the world-wide choice for ultra-accurate machining.



RANGE OF TABLE SIZES

No. 2C	18" x 10¾"
No. 3K	21½" x 15"
No. 4G	27½" x 23⅝"
No. 5G (illustrated)	43⅜" x 32"
Hydroptic-B	39½" x 32"

We also represent in the United States other world-famous Swiss High Precision Equipment: Andre Bechler—Maag Gear Wheel—Mikron—Safag—Studer—Sallaz Schaublin—Lienhard—Billeter.

HIGH PRECISION MACHINE TOOLS AND MEASURING INSTRUMENTS

COSA CORPORATION

COSA

CHRYSLER BUILDING
New York 17, New York

TOLERANCE, .0002" FINISH, 10 MICRO INCHES

On Bearing Races at National Sewing Machine Co.

with the SUNNEN PRECISION HONING MACHINE

That is the performance of the Sunnen Precision Hone on a production basis, honing bearing races for aircraft bearings. These races are heat treated steel with a C scale Rockwell of 60-62.

The versatility of the Sunnen Precision Hone is demonstrated in this plant, where jobs ranging from an inside diameter of .1895" to 2" are handled. Even on the larger pieces, tolerances are never over .0005".

This is another example of the many hundreds of uses for the Sunnen Precision Hone on both war and peace-time jobs where accuracy and smooth finish are important. This machine will accurately hone any internal diameter from .185" to 2.625" with a guaranteed accuracy of .0001". Holes are straight and true and can be given a finish that is exceptionally smooth — often 2 to 3 micro inches. This means longer life of parts, fewer rejects, and greater interchangeability of parts.

It does not require skilled labor, no jigs or fixtures are needed, can be set up in one to two minutes, is economical to operate.

Why not find out how the Sunnen Precision Hone can be used in your plant? A Sunnen engineer will be glad to show you how it can help you get greater accuracy and smoother finish in less time — or write for free bulletin giving complete details.

Typical Jobs

Automobile Distributor Shaft Gears Taper removed at a rate of 80-90 per hour.

Aircraft Valve Guide. Valve tappet roller pin hole honed to 6 micro inch finish.

Roller Bearing Outer Race. Finish improved from 12 micro inches to 2 micro inches.

Compressor Yoke. Alignment maintained and better finish produced.

Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping — and gave a straighter hole.

SUNNEN

SUNNEN PRODUCTS COMPANY, 7941 Manchester Ave., St. Louis 17, Mo.

Canadian Factory: Chatham, Ontario

800 YEARS

OF LATHE BUILDING EXPERIENCE

Axelson Lathes, of various lengths, are manufactured in 14, 16, 18, 20, 25 and 32-inch sizes.

Behind every reputable machine tool stands a group of engineers and artisans responsible for the reputation it enjoys... The above group of 37 Axelson employees was taken recently at the plant... Pictured are men from the "front office", engineering department, foundry, machine shops and assembly division... And these are only some of the Axelson veterans... men who have grown up proudly with the great Axelson heavy duty Lathe... The continuous service-range of men in the picture is between 17 and 33 years with Axelson, and the total represents more than *800 years of Lathe building experience*... That's 800 years of the know-how that has created the beauty, versatility, speed, precision and economy of operation built into the Axelson Lathe in more than thirty years of manufacturing... The result is best summed up in the words of the Axelson motto: "There is no Economical Substitute for Quality."

AXELSON MANUFACTURING CO.

6160 S. Boyle Ave. (Box 98, Vernon Station), Los Angeles 11, Calif. • 50 Church St., New York City 7 • 3844 Walsh St., St. Louis 16, Mo.

AXELSON LATHES

Dependable for over a Quarter Century

THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

ARTER

For Shafts

Automatic handling of work with plunge cut grinding. This highly productive grinder maintains concentricity of diameters as the work is ground on centers.

Name of part.....Washing machine motor shaft

Material.....S.A.E.B. 1112 CR Steel

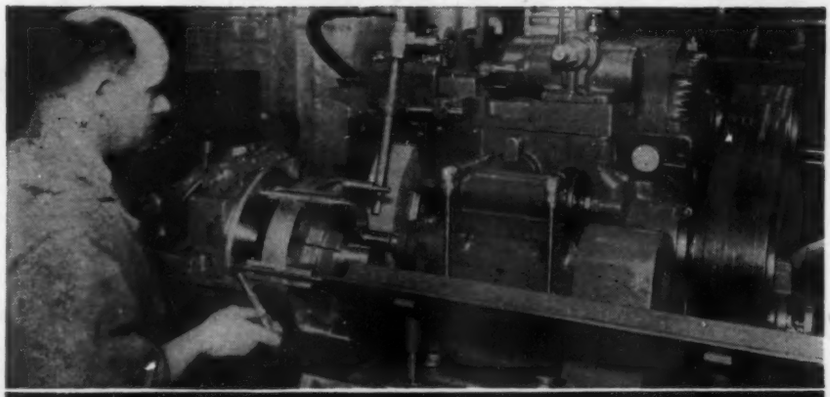
Stock removed.....012" average

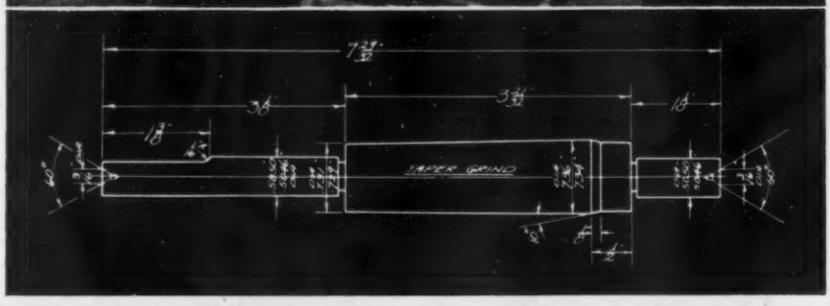
Limits.....0004" on bearing diameters

Surfaces ground.....Three

Production.....300 finished pieces per hour

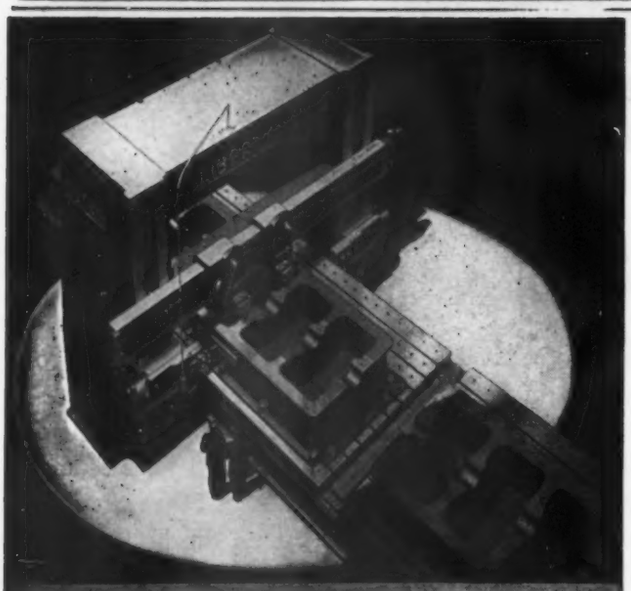
No. 135 Automatic Cylindrical Grinder





ARTER GRINDING MACHINE COMPANY

WORCESTER, MASSACHUSETTS • U. S. A.



LIBERTY

SMALL, MEDIUM AND HEAVY DUTY

PLANERS

FOR HIGH SPEED, LOW COST PRODUCTION

LIBERTY PLANERS • HAMILTON, OHIO, U. S. A.

Over a Quarter Century of Specialized Experience with Time Tested Principles of Design

Post Card

LELAND-GIFFORD COMPANY

A card addressed to any of our offices will bring a qualified engineer right to your door.

PRODUCTION DRILLING MACHINES

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CLEVELAND, O.
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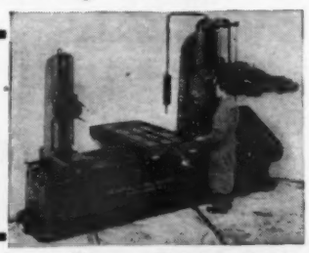
ROCHESTER, N. Y.
Commerce Bldg.
WORCESTER, MASS.
for New England

LELAND GIFFORD

WORCESTER 1, MASSACHUSETTS, U. S. A.

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

Made in 3", 4" and 5" spindle sizes.
Write for complete, detailed specifications.



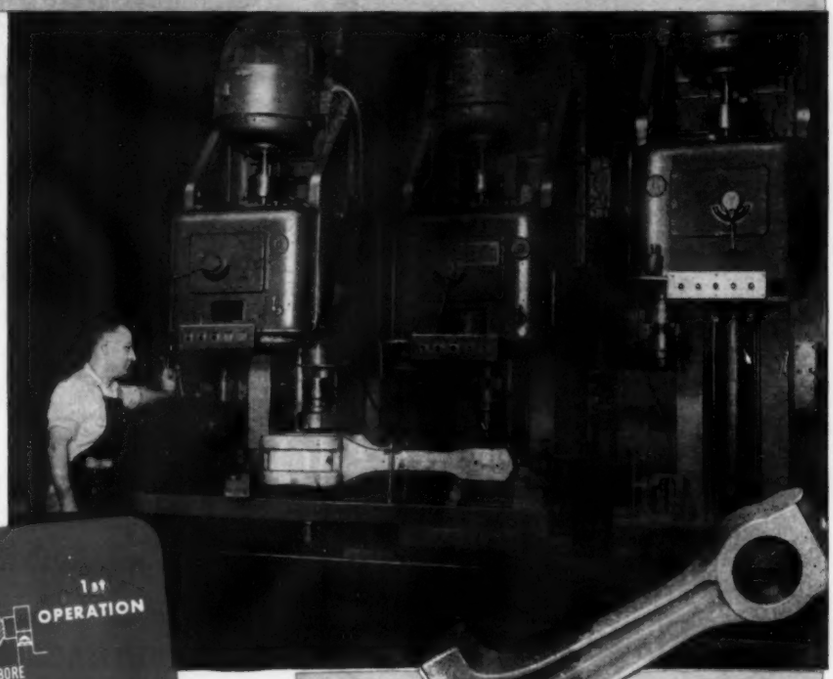
Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.

Hudson, Mass., U. S. A.

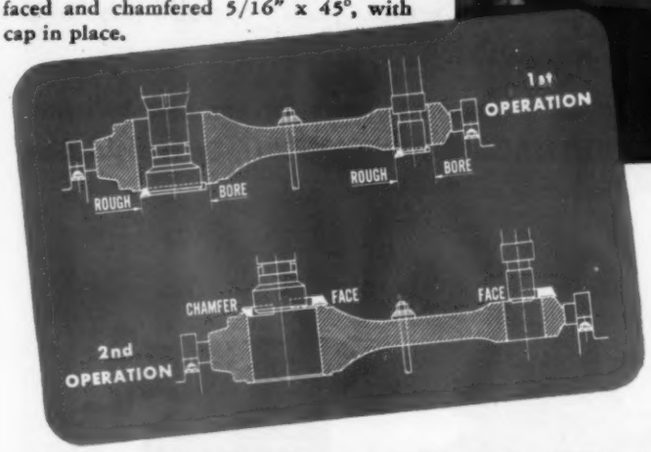
9 Minutes TO BORE AND FACE MAIN BEARING and WRIST PIN HOLES

Special Three - Column Boring Machine provided with semi-automatic cycle of rapid traverse, feed, fast feed, slow feed, traverse return and stop. Manual shift for quick gear change, variable speed motors and pick off gears give wide range of spindle speeds. Reverse feed is provided for back boring and facing. Machine has 30" feed stroke and the distance from the fixture platen to spindle nose is 8" min.–38" max.



● At this diesel engine manufacturing plant, the main bearing and wrist pin holes in large diesel engine connecting rods are *bored* and *faced* on a W. F. and John Barnes Special Three-Column Vertical Boring Machine. The connecting rods are designed so that the wrist pin end has no cap to bore. Center distances of the rods vary from 21" to 48".

In nine minutes, a wrist pin hole, 5.994" diameter, and main bearing, 10.0625" are rough bored; and in a second operation, faced and chamfered 5/16" x 45°, with cap in place.



View of connecting rod showing main bearing and wrist pin hole.

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W. F. and John Barnes, in conjunction with the customer's design engineers, designed and built this special machine for performing specific operations on a particular workpiece, which varies in size and diameter.

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When extra large rods are machined, the two outer spindles (maximum center distance 96"), are used. Each head can also be operated as an independent boring machine.

For Production Men . . . . . .

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W. F. and JOHN BARNES

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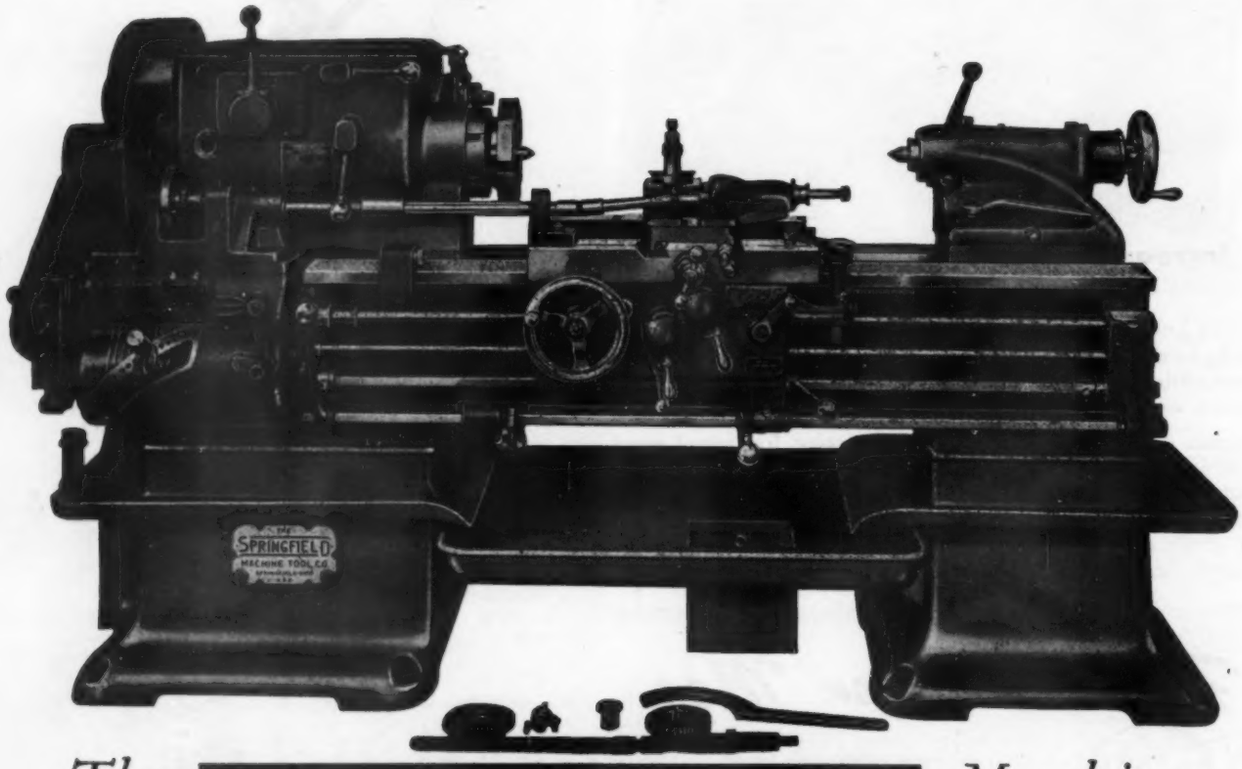

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- ★ Direct reading indicator for feeds and spindle speeds.
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- ★ Fast travel to all units.
- ★ Spindle and feed units run in bath of oil.
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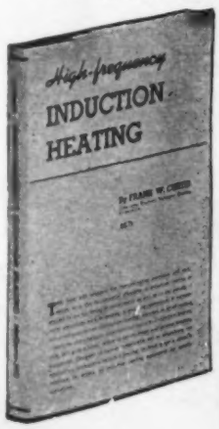

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Gives the principles, design details, and techniques of high-frequency induction heating resulting in

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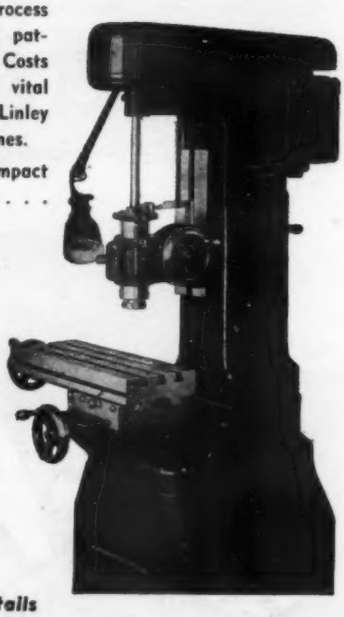

This versatile small and compact unit does a variety of work . . . saving larger machines for their rated capacity. Rapid changeover from one type of production to another . . . equipped with 8 spindle speeds—275 to 4250 r.p.m.—a speed for every need.

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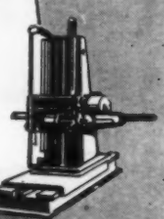

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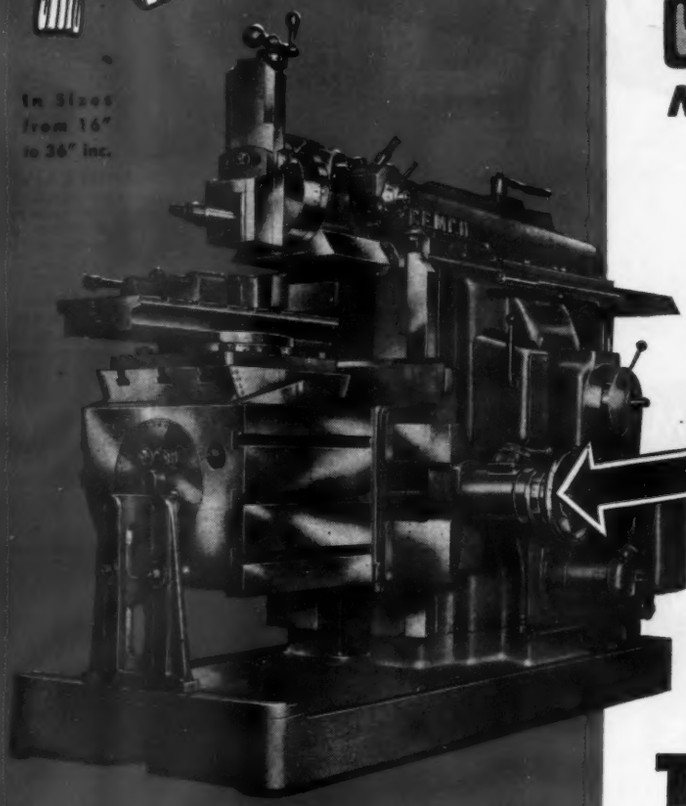
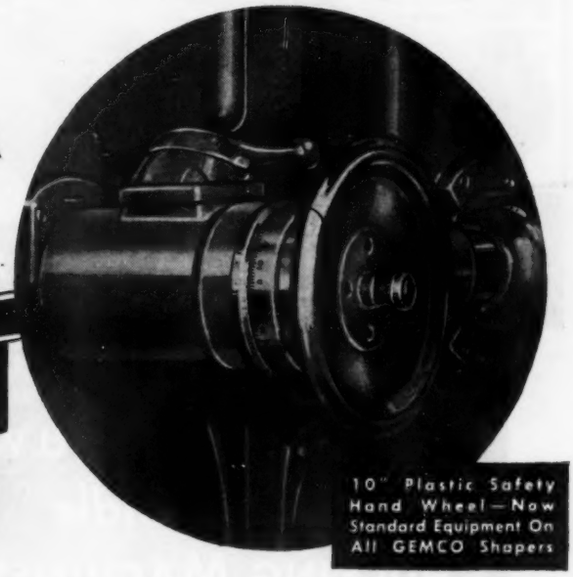


In Sizes from 16" to 36" inc.



10" Plastic Safety Hand Wheel—Now Standard Equipment On All GEMCO Shapers

THIS practical, protective Safety Hand Wheel is the answer to users' requests for a hand wheel to facilitate fine adjustment of the table on the cross rail. These adjustments are not readily performed, with the conventional crank, when the operator's attention is focused on the work piece. The Hand Wheel surface is always in position for convenient manipulation under these circumstances.

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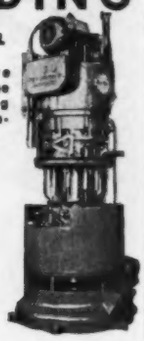

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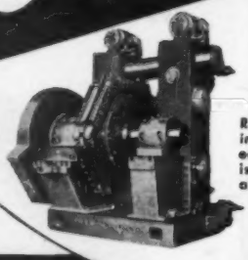

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Roughing and finishing cutter spindles in each column with finishing spindles adjustable for toe cut.

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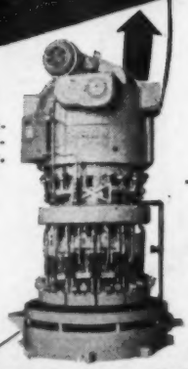
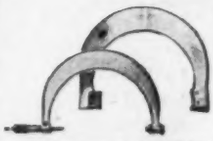
Continuous operating having a capacity of 1½ in. in steel.





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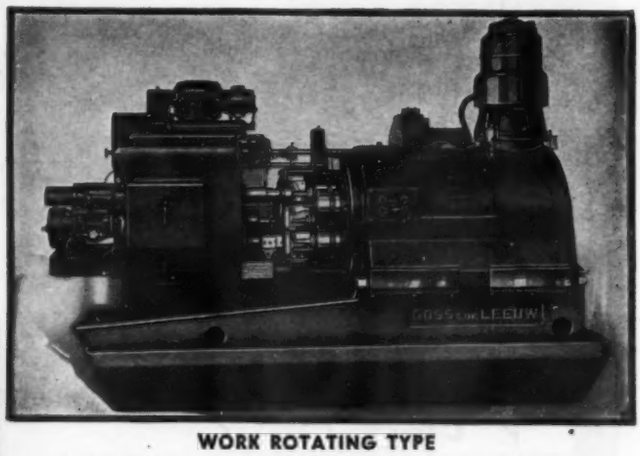
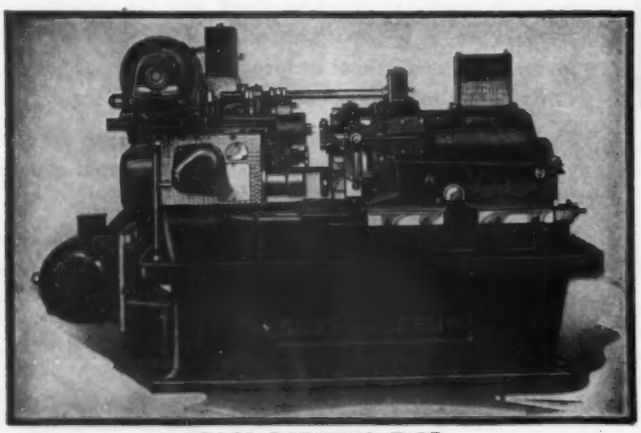
Multiple Spindle
CHUCKING MACHINES



WORK ROTATING TYPE
5 Spindles • 6 Spindles • 8 Spindles



TOOL ROTATING TYPE
4 Spindles • 5 Chucking Positions

Both types of machines provide lead screw threading. Oversize spindles on these machines are mounted on pre-loaded anti-friction bearings. Ways are hardened; gears are of chrome-nickel steel, carefully heat-treated.

The many modern features offered in these machines are fully described in catalog available on request.

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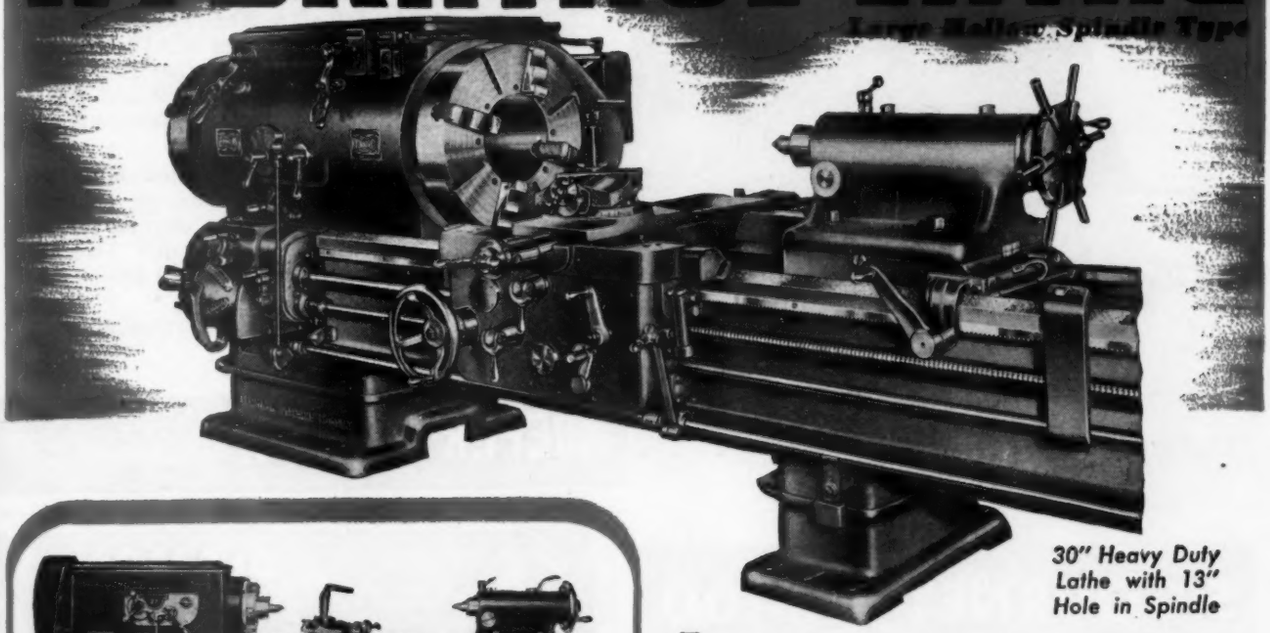
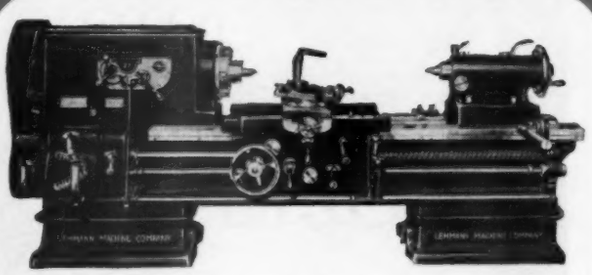
Large Hollow Spindle Type



30" Heavy Duty Lathe with 13" Hole in Spindle



Standard Type, Heavy Duty HYDRATROL LATHES, 20" to 36"

The big 27" size, shown above, has all the ruggedness and power for the heaviest possible work. And its many refinements in design and construction result in an ease of operation comparable to small machines.

In hundreds of plants—under all sorts of conditions—LEHMANN HYDRATROL LATHES have invariably brought about faster production, better work, lower costs.

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Small	18" up to 7 1/4" Hole
Medium	24" up to 12" Hole
Large	27" up to 13" Hole
Large	30" up to 14" Hole
Large	36" up to 16 1/2" Hole

(Standard type lathes, 16" to 36")

Lehmann MACHINE COMPANY

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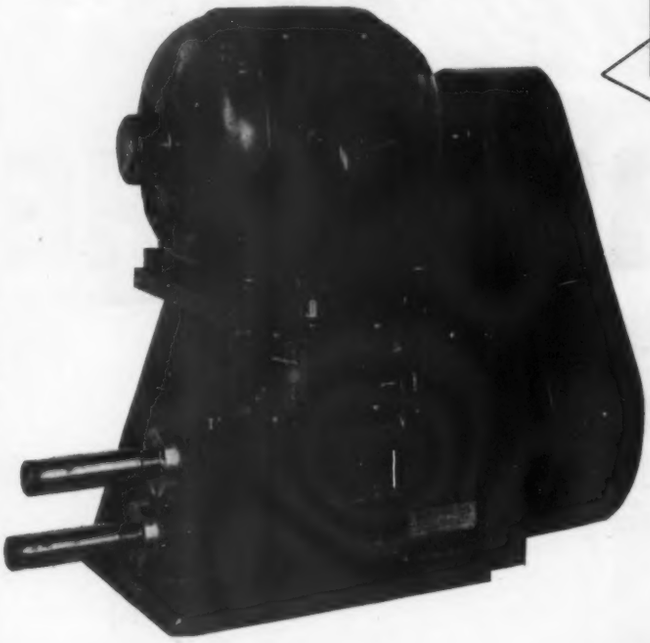

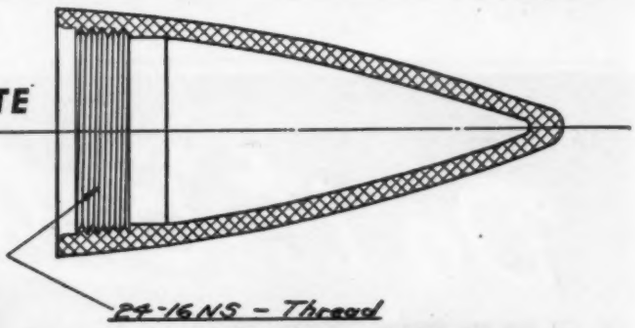

★ The two-spindle reversing, motor driven, Tapping unit was a part of a four-station Indexing Machine working on aluminum windshields for shells. Loading took place in Station No. 1, machining operations in Stations No. 2 and No. 3, while in Station No. 4 the tapping operation shown took place.

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fits all bores 1" to 7"

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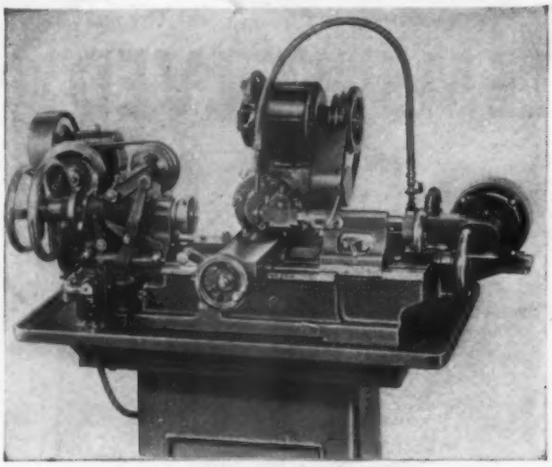

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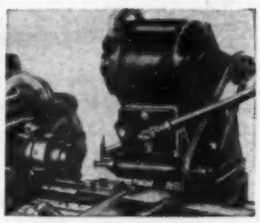
Three motors are employed on WALTHAM machines, permitting individual speed changes for cutter and work and constant speed for pump. Available speeds are provided for cutting either brass or steel. A single start and stop station controls all motors.



Machine equipped with Internal Threading Attachment

Specifications:

Swing over carriage—3"
Capacity—(dia. of work)—2" or smaller
Thread length (work on centers) —8¾"
Thread length (work chuck-held) —10"
Dia. hole through spring chuck— ⅝"
Dia. hole through work spindle— ¾"
Max. distance between centers— 12"
Floor space—48" x 34"

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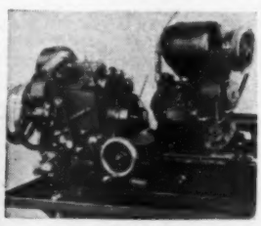
Special equipment, extending the utility of WALTHAM THREAD MILLERS, includes attachment for relieving, taper, internal threading, multiple cutter threading, translating gears, metric lead screw, cam operation, special tailstock for multiple cutter work.



Machine equipped with Relieving Head

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FLEXIBLE SHAFT MACHINES
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CHEAPEST IN THE END
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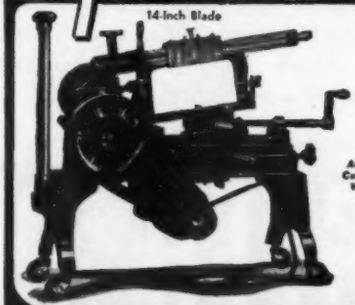

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WELLS No. 8 METAL CUTTING BAND SAWS

The test of a machine is with the man who uses it. Ask men who've used Wells No. 8s, what they think of them.

"Easy to use" will be your answer. All you do is clamp your metal—any size or shape that will fit—into the quick acting vise. From then on, the machine does the work. Both feed and shutoff are automatic.

Because they are so simple to use, one man can operate two or more Wells No 8s at the same time. One saw can be used for all odd metal cut-off jobs or can be equipped with a Wells Wet-Cutting System for quantity runs. Time and labor can be saved by moving the portable Wells to the work.

Any shop man will use a Wells safely and efficiently. Skilled mechanics use Wells Saws to save time and work. Take a tip from men who know . . . because they use Wells Saws and like them. Put a Wells No. 8 to work in your shop . . . now.

Specifications

CAPACITY: Rectangular	8" x 16"
(Special Guides)	5" x 24"
ROUNDS:	8" Diameter
MOTORS:	½ H.P., A.C. or D.C.
SPEEDS:	Selective 60, 90, 130 feet per minute
WEIGHT:	Approximately 665 pounds

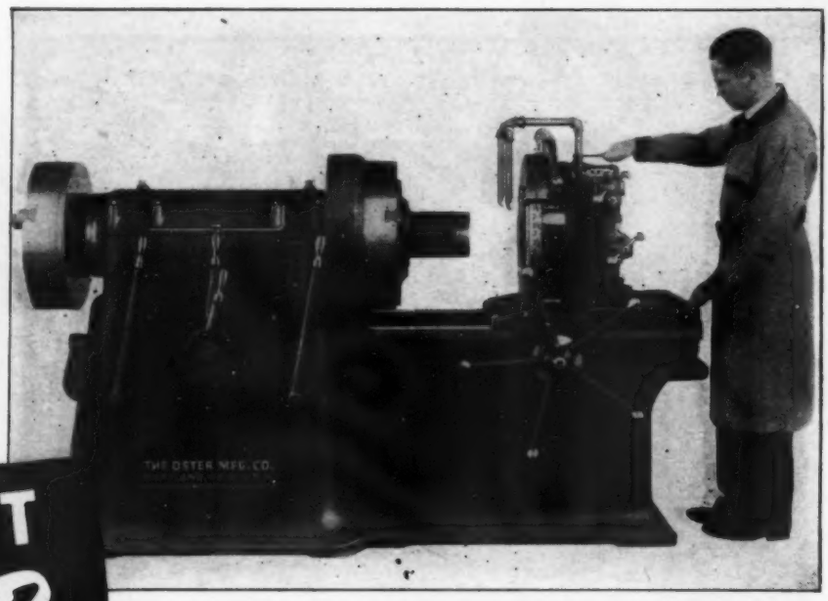
Wells SAWS
THE SIGN OF SERVICE

Wells

Products by Wells are Practical

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
505 ROOSEVELT ROAD, THREE RIVERS, MICHIGAN

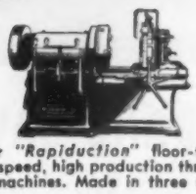


THREAD IT *FASTER* WITH AN OSTER

The Oster "RAPIDUCTION" pictured above is one of three models in this line of high speed, high production pipe and bolt threading machines. No. 6-A has a standard range of 1½" to 6" pipe and a bolt range of 1" to 4". No. 8 (illustrated) has a standard range of 2½" to 8" pipe. No. 12 standard range is 3½" to 12" pipe.

Among the many important features of Oster "RAPIDUCTION" machines is the single, easily adjustable die-head which, with one set of holders, covers the entire range of each machine. A single set of *high speed steel* dies threads all sizes of American and A. P. I. Standards, where the pitch and taper are the same.

From the big "RAPIDUCTIONS" to the No. 422 "Power Vise Stand" (illustrated at right) the Oster line of power threading machines and related equipment offers an exceptional range of selectivity to meet practically every pipe threading requirement.



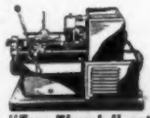
Oster *"Rapiduction"* floor-type, high speed, high production threading machines. Made in three sizes.

Oster *"Wilco" power threading machines* designed for maintenance and production threading. Two sizes.

Oster *No. 300 Series* general purpose threading machines with revolving die-head and open type vise. Three sizes.

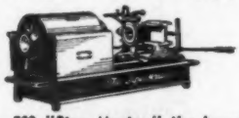
No. 542 *"Rapiduction Junior"* with revolving die-head and open type vise. Handles wide variety of threading work.

No. 572 *"Rapiduction Junior"* . . . floor type power pipe machine equipped with revolving die-head and open type vise.



No. 531 *"Tom Thumb,"* rotary die-head type designed for threading bolts, rods, studs, pipe, nipples, etc.

No. 422 *"Power Vise Stand"* converts hand tools to power tools for threading, cutting, reaming pipe.



No. 502 *"Pipe Master,"* the lowest priced complete, portable power pipe machine on the market.

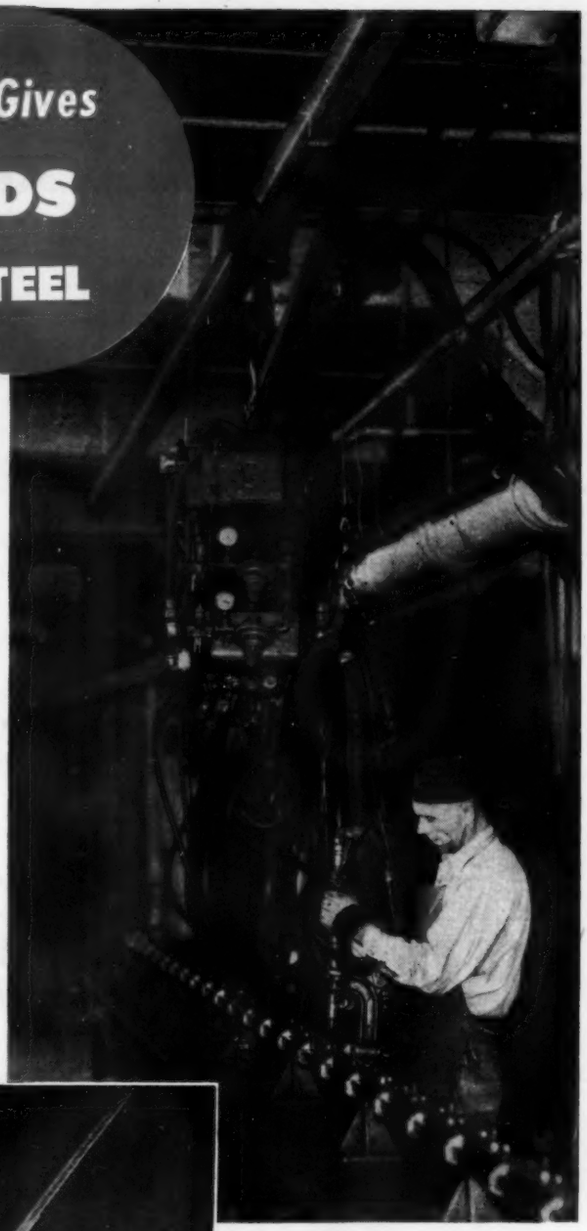
No. 562 *"Tom Thumb,"* another Oster portable power pipe machine designed for speed and accuracy.

OSTER ***machines make jobs***

THE OSTER MANUFACTURING COMPANY, 2049 EAST 61st ST., CLEVELAND 3, OHIO, U. S. A.

New Tempering Attachment Gives

STRONGER WELDS IN AIR-HARDENABLE STEEL



Ladder sections are welded on this specially designed welding machine, which is suspended from an overhead monorail and moves the length of the ladder side rail.

●Fire-fighting ladders of low-alloy steel are now being spot-welded by a new method at the American-La France-Foamite Corporation, Elmira, N. Y. The welding machines are equipped with G-E synchronous electronic control and a new G-E tempering attachment.

HEAT TREATING ELIMINATES BRITTLENESS

To meet exacting strength requirements, these lightweight ladders must have tough, ductile welds. Such welds cannot be made in air-hardenable steel by normal methods because chilling effects of the water-cooled electrodes would cause the weld nugget to be brittle. And the weld, as a result, would be weak.

Use of the tempering attachment, by which the work is heat treated without removing it from the welding machine, makes possible consistently strong welds.

HOW IT'S DONE

The weld is made in the normal manner. When its temperature has dropped to approximately 200 to 300 degrees above room temperature, current is passed through again. Adjustment of this current, which differs in both time and magnitude from that used in the welding, is provided by the tempering attachment.

The additional heating, or tempering, materially increases the toughness and ductility of the weld.

FOR ADDITIONAL FACTS

Wherever medium-carbon, low-alloy, or high-alloy steels must be joined, spot welders with G-E tempering control will give a product of maximum strength. For further details about this control, get in touch with your resistance-welder manufacturer or our nearest office. Ask for our Bulletin GEA-4201. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

● ● ●

In this strength test, the American-La France-Foamite 100-foot, all-steel fire-fighting ladder supports weights totalling 3,200 pounds at an angle of 60 degrees.

● ● ●

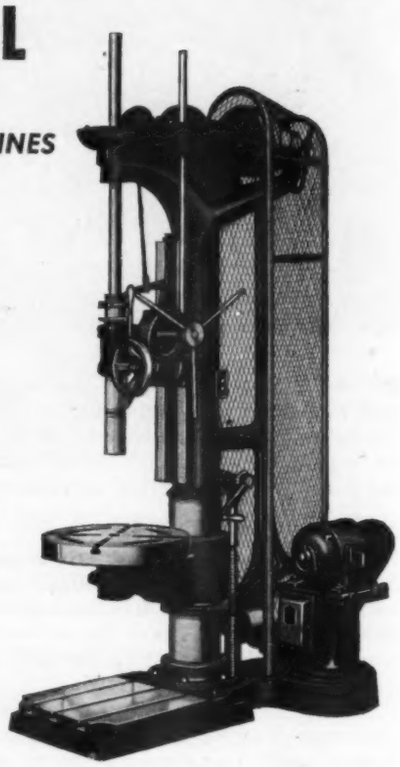
RESISTANCE WELDING CONTROL

8960

GENERAL ELECTRIC

FAST-ACCURATE-ECONOMICAL

PRECISION WORK WITH STANDARD DRILLING MACHINES



Fast—Sibley Drilling Machines, available with 20, 24, and 28 inch swing, stand out in their field for simplified design that makes for fast, easy, accurate operation. Famous for quick, skillful production in tool room or factory.

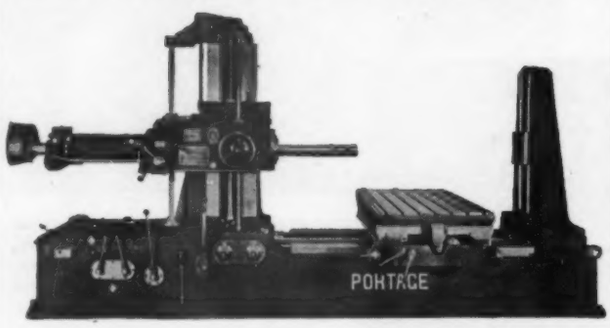
Accurate—Sibley Drilling Machines meet your requirements in producing to very close tolerances. For exacting specifications check the advantages Sibley Drilling Machines offer your production schedule.

Economical—Sibley Drilling Machines are listed at unusually low initial cost, give long and efficient service at highly remunerative rates. Exceptionally low maintenance. Wide range of power feeds.

SIBLEY MACHINE AND FOUNDRY CORP.
20 East Tutt Street, South Bend, Indiana

DRILLING MACHINE MANUFACTURERS SINCE 1876

PORTAGE



NO. 4 HORIZONTAL BORING DRILLING & MILLING MACHINE

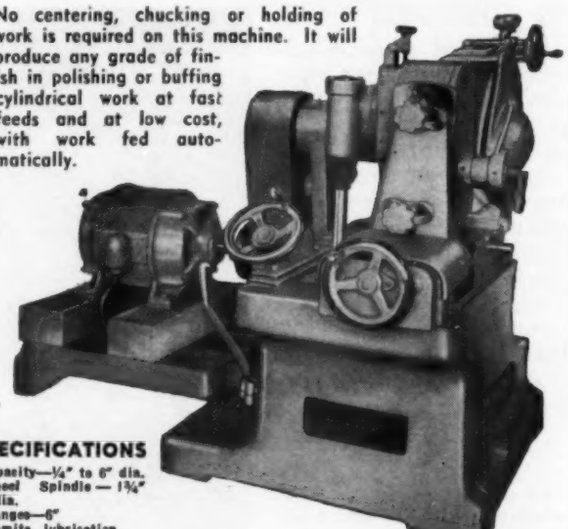
• A ruggedly built machine capable of operation at maximum speeds and feeds to produce accurately finished work. . . . Machine furnished with coolant type table with either 36" x 60" working surface and 48" cross travel, or 48" x 72" working surface and 60" cross travel. . . . Extra height columns increase working capacity. . . . For greater speed—precision—high production specify PORTAGE.

WRITE for full descriptive bulletin today.

THE PORTAGE MACHINE CO.
AKRON 11, OHIO

Better, faster, lower cost finishing on the "PRODUCTION" No. 101
CENTERLESS FEED POLISHING MACHINE

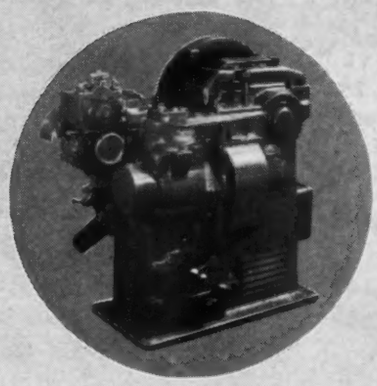
No centering, chucking or holding of work is required on this machine. It will produce any grade of finish in polishing or buffing cylindrical work at fast feeds and at low cost, with work fed automatically.



SPECIFICATIONS
Capacity—¼" to 6" dia.
Wheel Spindle — 1¾" dia.
Flanges—6"
Alemite lubrication
Self-aligning ball bearings
H. P.—7½ to 10.

Write for bulletin giving complete information on single and tandem machines.

PRODUCTION MACHINE CO.
Manufacturers of Tool Grinders and Hand and Automatic Polishing and Grinding Machines.
GREENFIELD, MASS., U. S. A.



THE COMPANY WHICH IT KEEPS

Although introduced only a few years ago, today's list of National Cold Header users is a "Who's Who" of the bolt and rivet industry.

If you are not among those who are "cashing in" on it's wide possibilities, let us present you with the facts.

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO

New York Detroit Chicago

HAVE YOU BEEN OVERLOOKING *Thread Rolling?*

780 THREADS an hour
Part: ADAPTER
Thread: 2½" — 12 NS
2.2" — 24 NS
Material: SAE 1035 FORGING

Rolled by Precision Dies on the REED Cylindrical-Die THREAD ROLLER

Developed to a high degree of controlled accuracy, modern thread rolling now gives you both QUALITY and QUANTITY.

√ Lower Cost √ Wider Versatility
√ Greater Accuracy √ Smoother Finish
√ Greater Uniformity √ Increased Strength

Submit your threading problems to our engineers. Write for folder "THREAD ROLLING In Action".

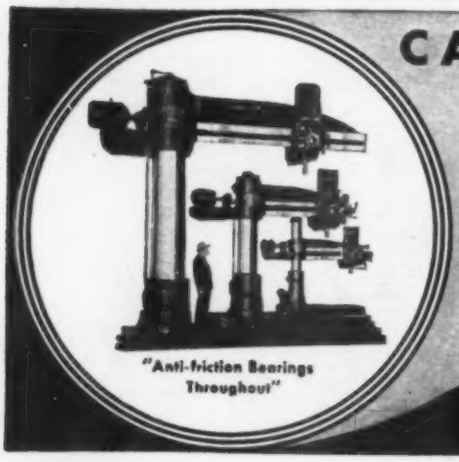
The REED Cylindrical-Die Thread Roller adds wider range, simple and more precise controls, and greater versatility to the recognized advantages of thread rolling. Prices and specifications upon request.

RTD Co

ROLLED THREAD DIE CO.
Thread Rolling Dies and Machines
237 Chandler Street - Worcester 2, Mass.

GEAR CUTTING MACHINES
New Design
New Features
New Advantages
NEWARK GEAR CUTTING MACHINE CO.
69 Prospect Street, NEWARK 5, NEW JERSEY
FRANK E. EBERHARDT, *President*

MILLHOLLAND
Automatic DRILLING - BORING MILLING - TAPPING Units
½ to 20 HORSEPOWER DRIVE
AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY
W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.



"Anti-friction Bearings Throughout"

CARLTON RADIAL DRILL
FEATURES — 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The CARLTON
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

ARMY E NAVY

What's all this about SUPERFINISH?

• If you've thought of *Superfinish* as a lavishment, then perhaps it's time to look into it a little further. You'll find enough evidence to change your notions—and perhaps give you a new competitive advantage in the form of lower costs.

No matter how fine a ground surface may appear to the eye, it has defects . . . scratches and ridges produced by the point of the turning tool . . . larger defects such as grinder feed spirals and chatter marks . . . partially loosened splinters of metal ready to come off on contact with another surface . . . soft surface metal, annealed by the heat of the grinding wheel. In practically every case, fragmented metal will be torn from the mating surfaces to mix with lubricants, causing abrasive wear and creating a larger amount of clearance.

Superfinishing prevents this by removing both grit scratches and longer pitch defects due to minute machine tool inaccuracies. It provides the surface smoothness to maintain a uniform oil film—to reduce wear—to eliminate bearing trouble and lengthen bearing life.

Superfinishing is a quick and inexpensive process. And in many cases it can reduce present manufacturing costs by eliminating other more costly processes. This is a good time to get complete information about *Superfinishing*. Write us.

GISHOLT MACHINE COMPANY

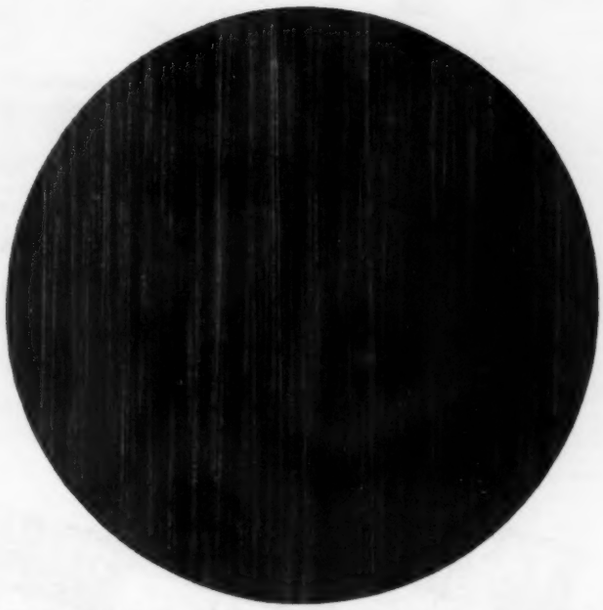
1201 East Washington Avenue • Madison 3, Wisconsin

GISHOLT

Look ahead

keep ahead

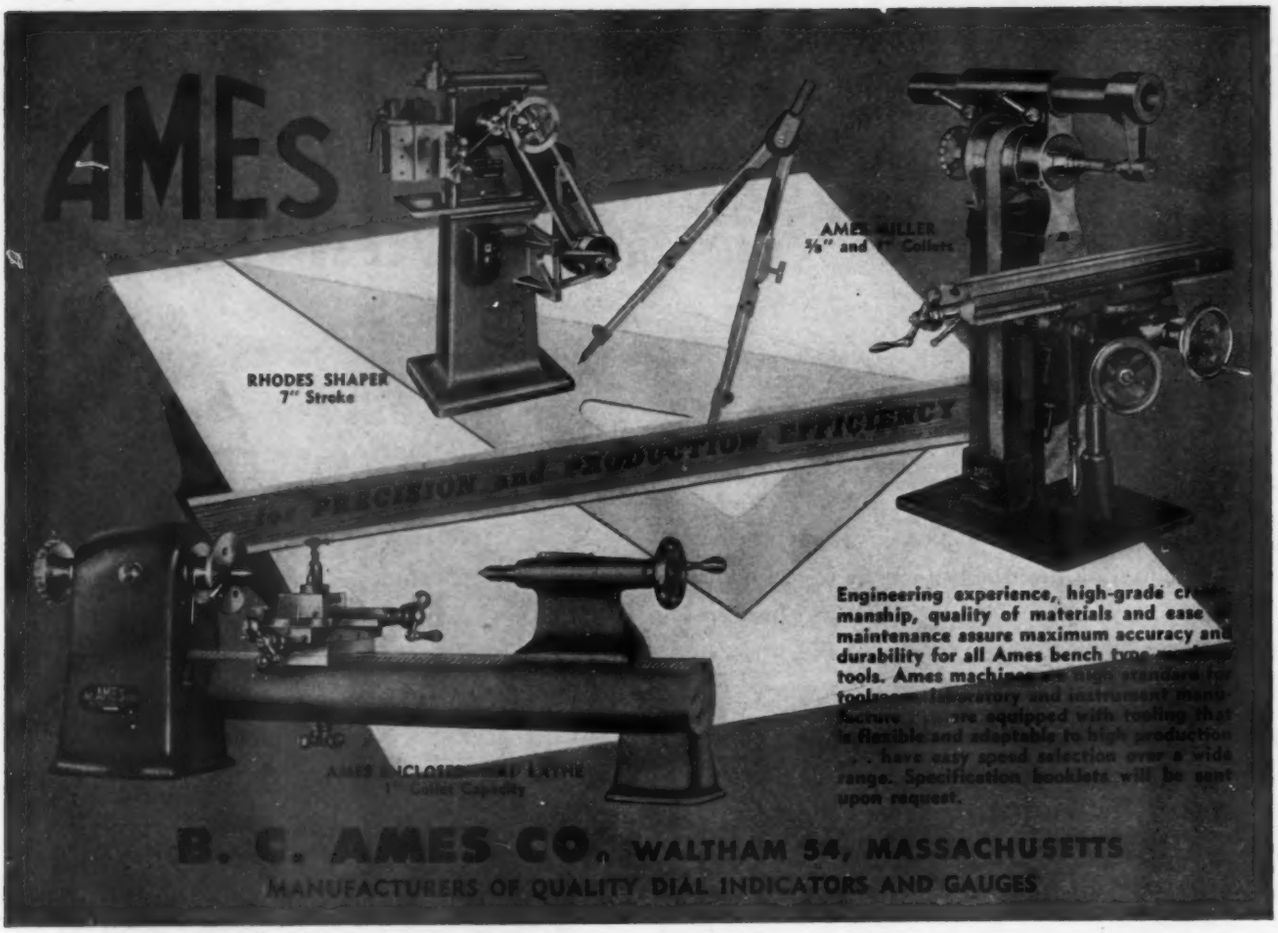
with Gisholt



This photomicrograph (25 x magnification) shows a ground surface with the familiar scratches and ridges caused by single direction stock removal. Surface roughness is 35 micro-inches (Profilometer reading).

The same piece, 30% Superfinished to 15 micro-inches. Note how ridges have been reduced. A completely Superfinished surface of 2 to 3 micro-inches will leave no defects to penetrate the oil film or abrade the mating surfaces.

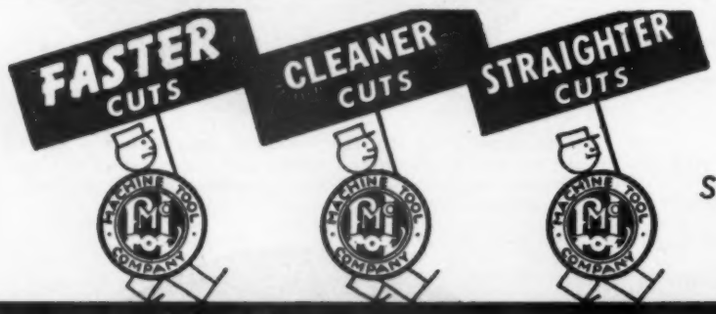
TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



Engineering experience, high-grade craftsmanship, quality of materials and ease of maintenance assure maximum accuracy and durability for all Ames bench type machine tools. Ames machines set high standards for toolroom, laboratory and instrument manufacture . . . are equipped with tooling that is flexible and adaptable to high production . . . have easy speed selection over a wide range. Specification booklets will be sent upon request.

B. C. AMES CO. WALTHAM 54, MASSACHUSETTS

MANUFACTURERS OF QUALITY DIAL INDICATORS AND GAUGES



assured by the **PORTER-McLEOD** COLD METAL SAWING MACHINE

Save Time *Save Costs*

Valuable time on war work can be saved by the 8" Porter-McLeod high production machine on all classes of work.

Its rating as a truly high production machine is the result of design features which make it possible to nest bars or shapes for multiple cutting, a method of holding the work securely during fast feeds, a unique upward blade movement through stock and a saw design which provides cutting action by every tooth.

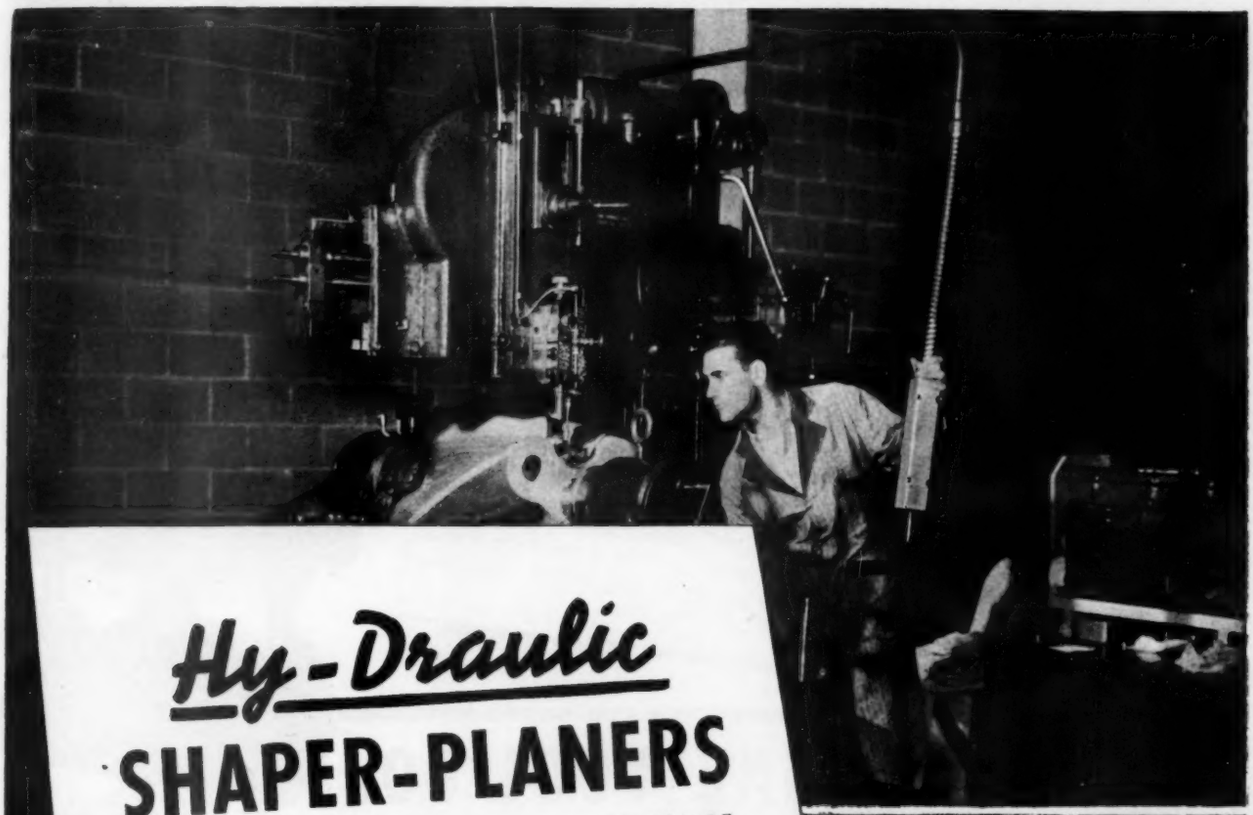
These features result in remarkably fast, clean, straight cuts. Sturdy construction and ample power contribute to its ability to handle a standard feed of 3" per minute. Capacity: 8" round or 7½" square stock.

Explore the possibilities of the 8" Porter-McLeod Machine on your high production cold metal sawing operations. *Write today for Descriptive Bulletin.*

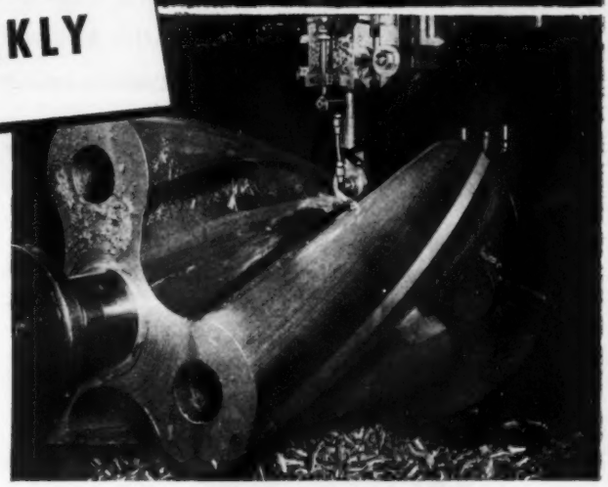
PORTER-McLEOD MACHINE TOOL CO., INC.

HATFIELD, MASS., U.S.A.

MACHINE TOOL COMPANY



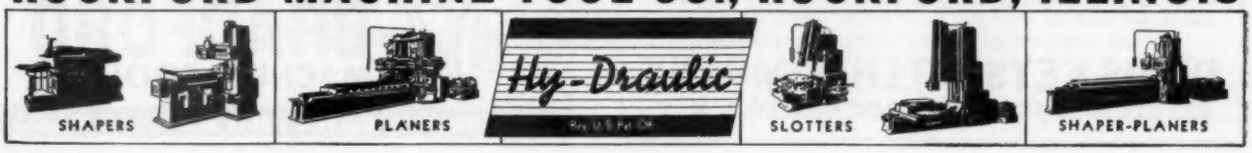
Hy-Draulic SHAPER-PLANERS CUT CONTOURS QUICKLY



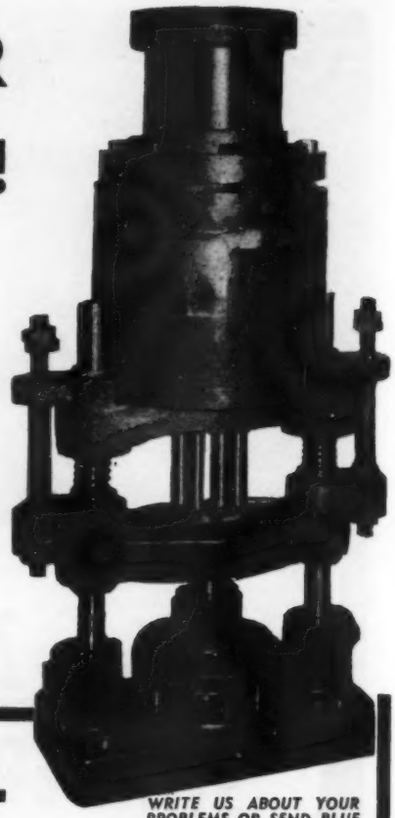
From rough casting to finished contours of blower impellers for Fairbanks-Morse opposed piston diesel engines is accomplished in two low-cost cuts by Rockford Hy-Draulic Shaper-Planers. Material machined is aluminum alloy. Surfaces are generated accurately, finish is excellent, keen cutting tools used are simple and inexpensive. Hydraulic drives, low inertia of reversing parts, cushioned reversals, quick return and easy operation of Hy-Draulic Shaper-Planers all contribute to high production of these contours at low cost. Eight similar machines in a row, some of them operated by women, maintained high output steadily through 2 and 3-shift operation. When temporarily ahead of the casting supply, several of these machines have been reverted to standard and used on high-priority tool work. On "shapes" and "straight" work, mass-production and "jobbing", Rockford Hy-Draulic Shaper-Planers are popular with operators, profitable for management. Write for details. Please address Department 1133.

4522

ROCKFORD MACHINE TOOL CO., ROCKFORD, ILLINOIS



Speed Up with BUHR SPECIALIZED TOOL-UPS!



SOLVE YOUR PRODUCTION PROBLEMS THE BUHR WAY!

For complete drilling toolup, and to aid you in solving your reconversion problem of retooling for profitable production we are ready to go with any job you have. Attached to a standard drill press, this toolup job consists of an 8 Spindle Drill Head, Bushing Plate and Fixture for one part, and provides an adapter to fit in the Fixture and hold a mating part. Thus two different parts are drilled from one equipment.

BUHR MACHINE TOOL CO.

837 GREEN STREET, ANN ARBOR, MICHIGAN

WRITE US ABOUT YOUR PROBLEMS OR SEND BLUE PRINTS AND WE WILL GIVE YOU THE CORRECT ANSWER.

KEYSEATING

The Modern Way

Illustration shows typical set-up for cutting taper keyways with table tilted.

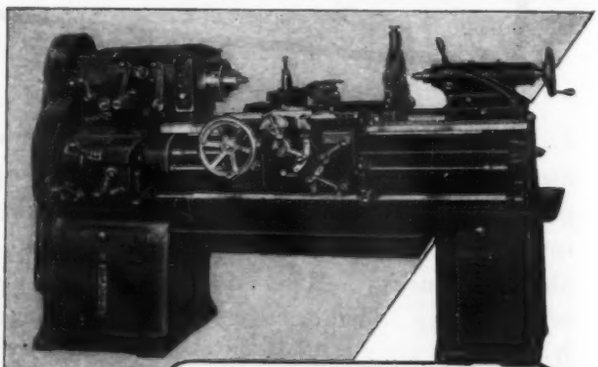
Machines are made in three sizes for keyways 1/16" to 1¼" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY

403 EXCHANGE ST. ROCHESTER 8, N. Y.



BRADFORD METALMASTER *does it faster*

Compare BRADFORD'S performance. You'll discover that for speed, accuracy BRADFORD ranks — first. Precision constructed the BRADFORD Metalmaster is designed for your wartime and peacetime jobs. Write for catalogs describing the advantages of this lathe.

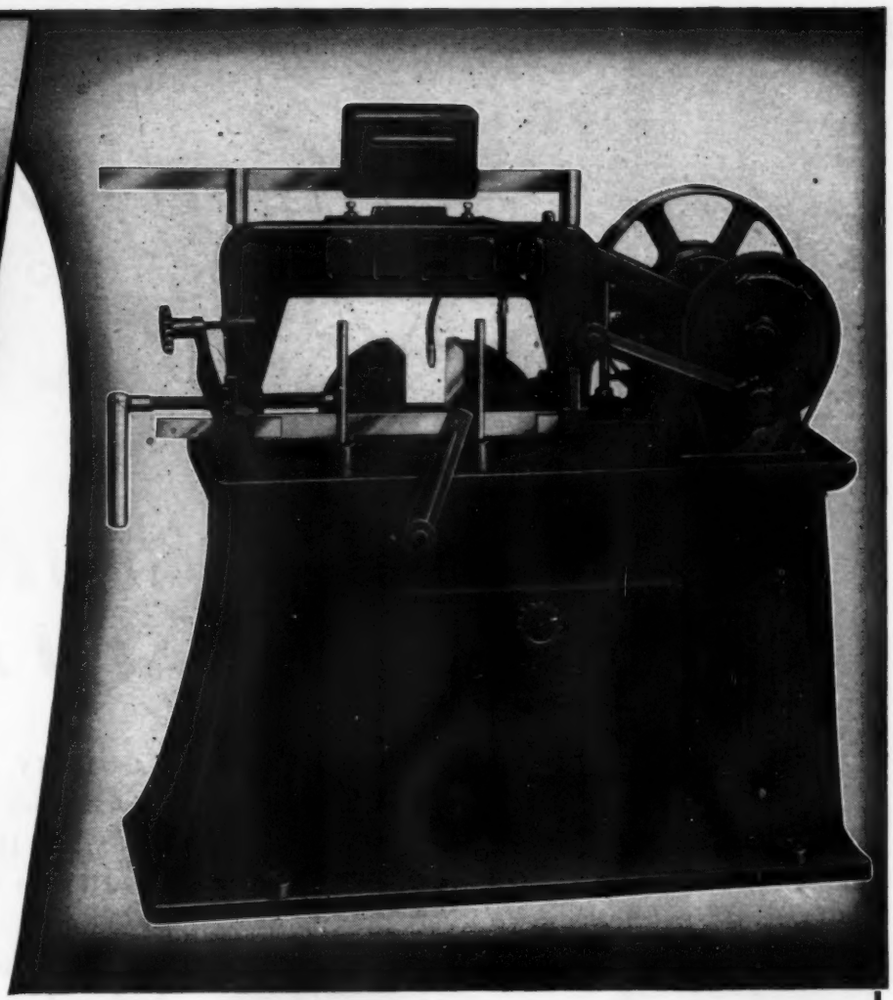
The BRADFORD MACHINE TOOL CO.

1840 — 1945 CINCINNATI, OHIO

L-W

NEW MODEL HIGH SPEED

POWER HACK SAWS



ALL-STEEL WELDED BASE
ALL-STEEL WELDED TABLE TOP
BELT DRIVE
GRAVITY FEED
LENGTH GAUGE
EXPANDING CLUTCH
DOVETAILED SAW FRAME GUIDE
SWIVEL VISE

ONLY

$180.15

IT'S EASY TO SEE WHY IT'S SO POPULAR

● Automatic trip stops machine on completion of cut . . . automatic relief of saw blade on non-cutting stroke. 6" x 6" capacity using 10" to 14" blades. Clutch pulley 12" x 3". Pulley speed 120 R.P.M. Frame is designed for maximum rigidity. Sliding bearing is dovetailed to fit arm and is adjustable in all directions. Swivel vise permits cutting at various angles. Coolant pump mounted inside the base.

3-speed V-belt Motor Drive arrangement which assures maximum power transmission efficiency and permits speed adjustments from 90 R.P.M. to 130 R.P.M. also available at $25.90, less motor. ½ H.P. standard speed, 1725 R.P.M. motor recommended.

Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products

L-W CHUCK COMPANY 20 N. ST. CLAIR ST. TOLEDO 4, OHIO

Gorham HIGH SPEED STEEL TOOL Bits

Tools of Superior QUALITY . .

● QUALITY, says the dictionary, is—"CLASS; kind, or grade. Excellence of character; as, the thoroughbred shows QUALITY." * * * That—if we may humbly bow to Mr. Webster—defines GORHAM High Speed Steel Tool Bits exactly. The production of good tool bits and turning tools for different applications requires great care in the selection and heat treatment of materials. Every GORHAM tool bit is the result of painstaking attention and superlative skill. It embodies our years of experience in helping Industry with a multitude of complicated and unusual problems. * * * Regardless of the type of job they tackle, GORHAM tools give top performance. The more exacting the requirements, the greater the challenge. For better production in YOUR plant, choose better production tools. *You can't go wrong with GORHAM!*

GORHAM TOOL CO.

14400 WOODROW WILSON • DETROIT 3, MICH.

In the face of rising costs

Tool up with TECO CEMENTED CARBIDE *and* GET MACHINING COSTS DOWN!

MORE PIECES BETWEEN GRINDS

MORE GRINDS PER TOOL

LESS DOWN TIME

LOWER TOOL COST

● Here is one definite step you can take to get more leeway between rising production costs and rigid price ceilings:

Use TECO Cemented Carbide to cut machining costs to new low levels. It holds cutting edges longer. It produces more pieces between grinds. It yields far greater production per tool than any similar material.

These facts are being demonstrated over and over in scores of cost-conscious plants. The reason? TECO Cemented Carbide has unequalled resistance to wear and breakage. The proof? *Try it yourself.* Put Teco to work in place of *any* carbide you are using. You'll find that the harder and tougher Teco out-produces any carbide you have ever used.

Immediately available in many standard sizes and shapes, in tool or blank form. Get your copy of our detailed catalog.

TUNGSTEN ELECTRIC CORPORATION
568 39th St., Union City, N. J.

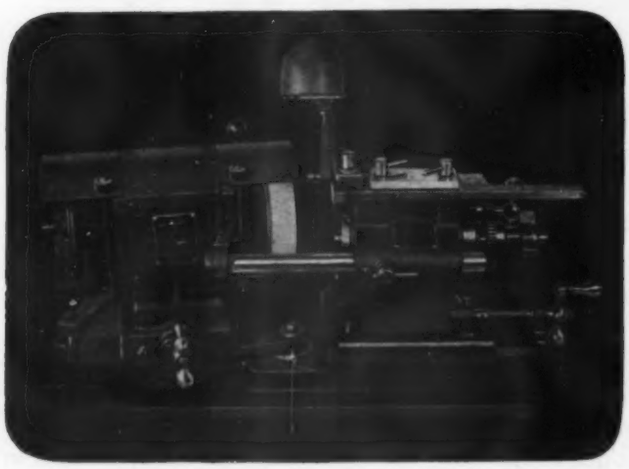
TECO
CEMENTED CARBIDE
Pioneers in Tungsten Carbides for over a Quarter Century

Branch Office: 403 Western Reserve Bldg., Cleveland 13, O.
Representatives: Indianapolis, Ind. Chicago, Ill. Detroit, Mich.

EDWARD
Blake
COMPANY

634 COMMONWEALTH AVE., NEWTON CENTRE 59, MASS.

NEVER A DULL MOMENT
When Taps are KEPT SHARP
with the
BLAKE TAP GRINDER



If your shop uses taps regularly, you can't afford to slow down production while waiting for taps to be sharpened by slow, outmoded methods.

With the Blake Tap Grinder you can sharpen taps the *quick*—the *modern* way. *Positive mechanical controls* make the accurate sharpening of taps a speedy and precise operation.

Taps *kept sharp* in the Blake manner will enable you to prolong the life of your taps so that every cent's worth of value is used up. You can grind any amount of relief desired . . . both right- or left-hand taps—*without* special gearing or fixtures . . . taps with 2, 3, 4, 5, 6, 8 or 10 flutes . . . from size No. 0 to 2". Mail the coupon today and make a start on solving your tap sharpening problems.

See this machine and the complete line of Blake equipment at the A. S. T. E. Show in Cleveland, April 8-12.

Please send me Bulletin No. 544 which describes the Blake Tap Grinder in detail. A.M.

NAME_____ TITLE_____

COMPANY_____

STREET_____

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BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—WALTHAM CUTTER SHARPENERS—HAGER CARBIDE TOOL GRINDERS

Kester has the RIGHT FLUX for Every Solder Job

• You can always get the right flux, from Kester.... a flux you *know* will properly clean, prevent oxidation, make way for a tight bond that will resist shock, vibration or bending as desired, and eliminate soldering failures.

• During Kester's 47 years of experience, hundreds of Kester flux formulas have been time-tested in laboratory and industry, to establish exact specifications for every flux need. Among them is the ideal flux formula for you.

• Write us, and Kester engineers will consult with you, without obligation.

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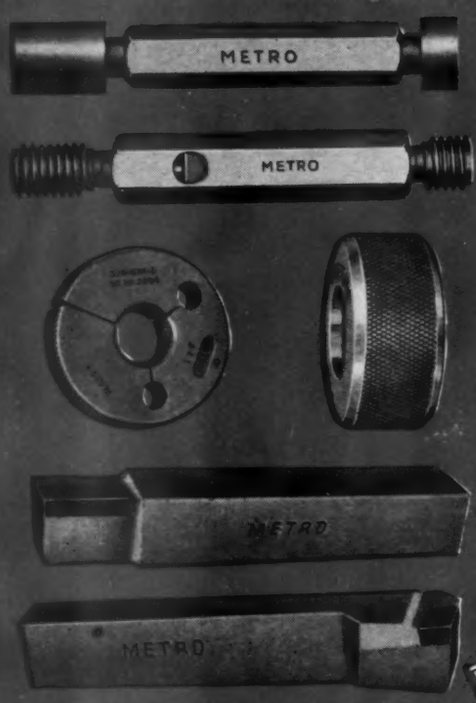

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METRO TOOL AND GAGE CO.
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It PAYS to control parts-dimensions to close limits. It pays in ease of assembly, in product performance and in the assured fit of replacement parts. In wartime, it paid richly in human lives saved. JO-BLOCKS, the pioneer precision controls, produced in America by Ford Motor Company only, for all industry, are warranted accurate to .000002", .000004" or .000008" ±, and are available in sets at $23 and upward, or in individual blocks, with various accessories. With properly selected genuine Jo-Block equipment, accuracy control can be maintained to the highest practical degree over the working gages required for any mechanical dimensional inspection.

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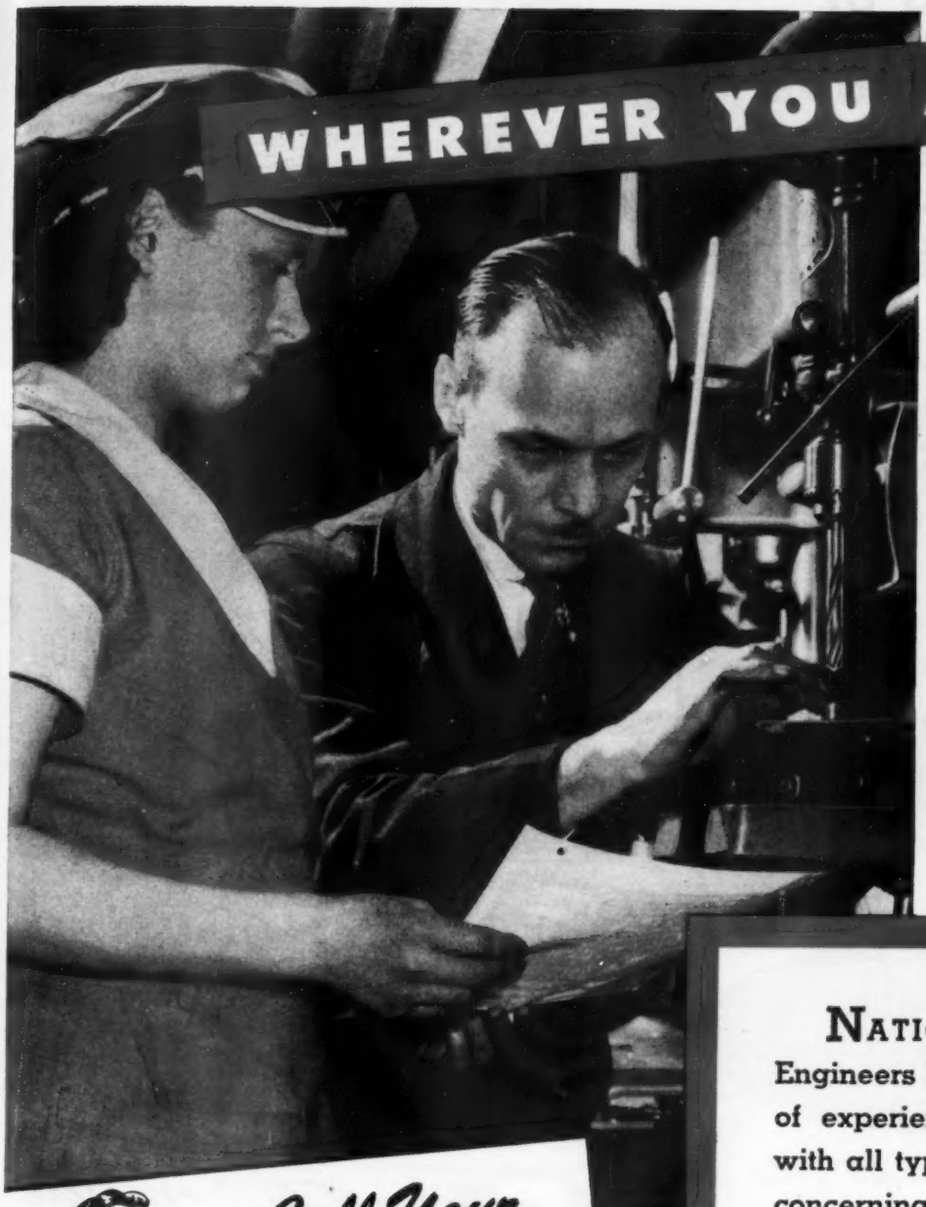
Profusely illustrated, with full details, covering selection, application and care of Jo-Blocks. Write Ford Motor Co., Johansson Division, Dept. 31, Dearborn, Michigan.

Ford Johansson GAGE BLOCKS



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DEFENSE DEMANDS
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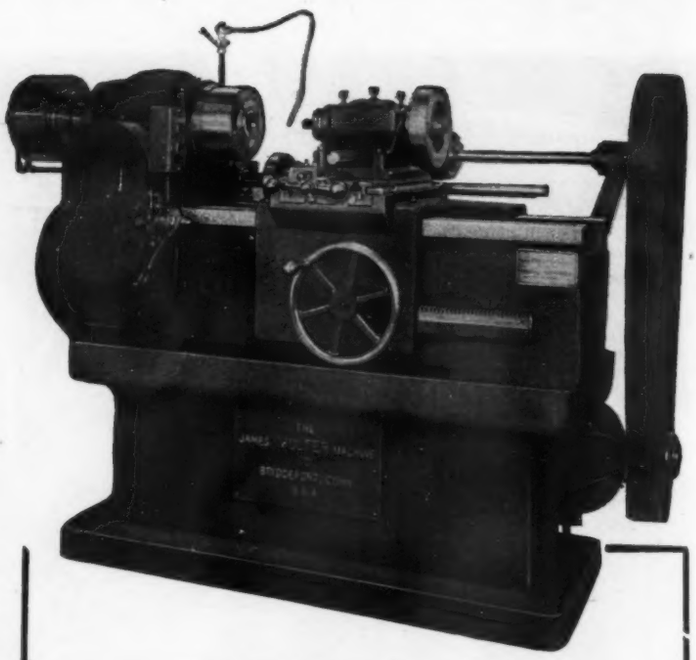
EXTERNAL and INTERNAL THREADS

The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.



Send for Descriptive Bulletin giving full information.

The James COULTER *Machine Co.*
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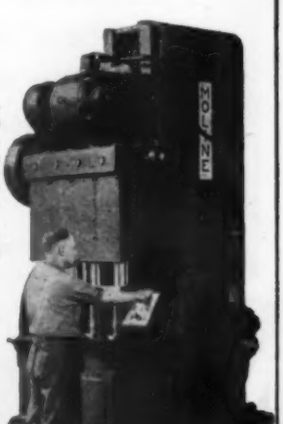
TIME-SAVING MACHINE TOOLS SINCE 1901

Moline Tool Company since 1901 has been designing and building machine tools of the highest degree of efficiency for these operations:

- Boring—rough, semi-finish and finish
- Honing
- Milling—(special machines)
- Straight Line Drillers
- Universal adjustable spindle drillers
- Way Type Machines—horizontal and vertical drilling, tapping and boring machines

"Hole Hog" machine tools are versatile—their construction makes possible easy change-over to other jobs. They are easy to operate and are ruggedly built for years of continuous production service. For man-hour savings—for more efficient, smoother work—look to Moline machines.

Write for information concerning machine tool equipment for your special problems.



MOLINE TOOL CO. HOLE HOG MOLINE, ILLINOIS

MOLINE TOOL COMPANY
105 20th Street MOLINE, ILLINOIS

Famous for

- ACCURACY OF THREADS
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Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

See our Advt. on page 280 Dec. 6, '45 American Machinist

THE EASTERN MACHINE SCREW CORP., 29-40 Barclay St., New Haven, Conn.
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GULF SUPER-QUENCH

we get greater hardness and lower cleaning costs"—

says the Chief Metallurgist of this Plant

This machine tool plant formerly using an ordinary quenching oil had considerable difficulty in obtaining a satisfactory hardness on their gears. With Gulf Super-Quench the average hardness obtained increased 6 points Rockwell.

"WHEN WE USED a conventional quenching oil, we had difficulty in getting the minimum hardness specified for our gears," says the Chief Metallurgist of this machine tool plant. "With Gulf Super-Quench we consistently average three Rockwell C points above the required hardness. This remarkable quenching oil has also made possible a big reduction in cleaning time, thus reducing our cleaning costs."

Here's why Gulf Super-Quench is a superior quenching oil: It has intensified dual-action—a faster cooling rate through the hardening temperature range. Call in a Gulf Service Engineer today and let him show you how Gulf Super-Quench can help improve your quenching practice. For your copy of the brochure on Gulf Super-Quench, send the coupon below.

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Please send me, without obligation, a copy of the brochure, "Gulf Super-Quench."

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MOLYBDENUM—TUNGSTEN HIGH SPEED STEELS

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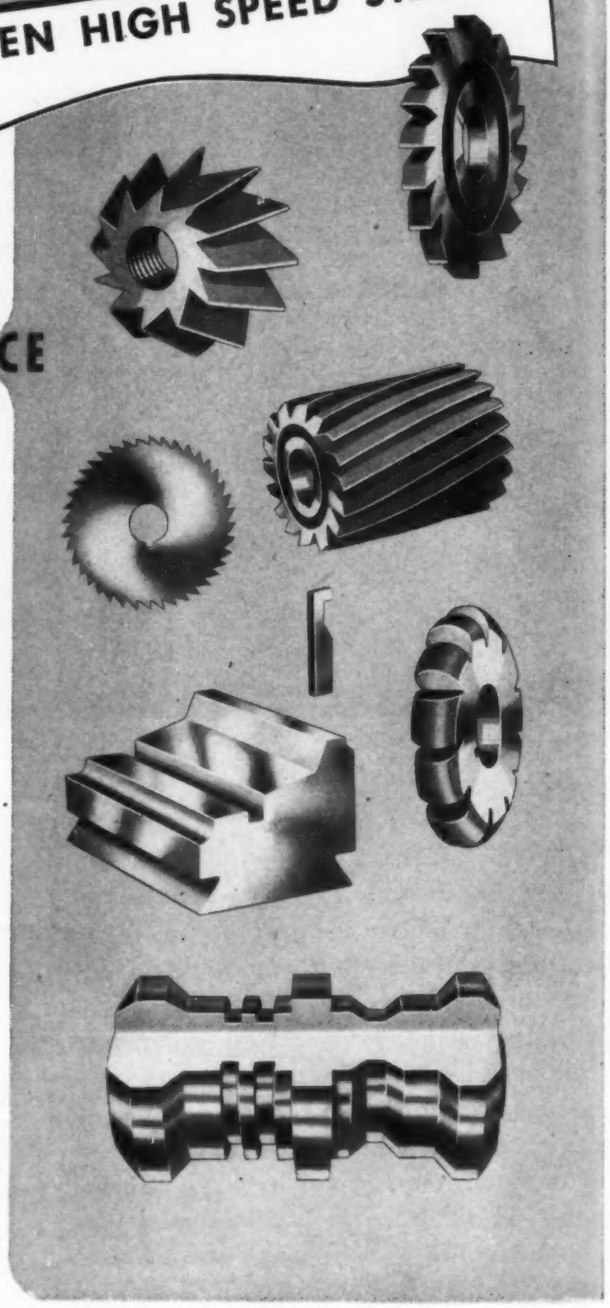
BETTER TOOL PERFORMANCE



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For the full story on MO-MAX high speed steels—their physical properties, their advantages, and how to heat treat them—write today to Department E for the new, revised MO-MAX Handbook.

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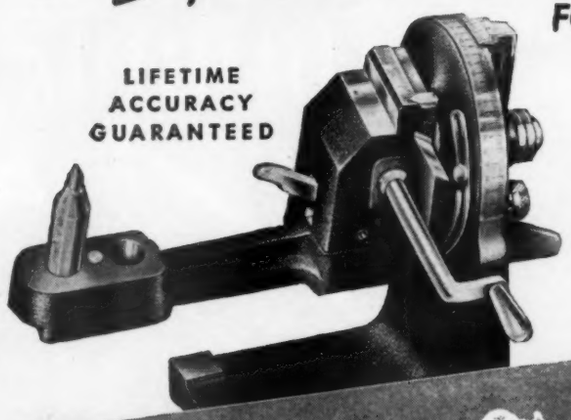
THE CLEVELAND TWIST DRILL CO. • 1244 East 49th Street • Dept. E. • Cleveland 14, Ohio

Bley CONTOUR DRESSER

FOR SHAPING GRINDING WHEELS

LIFETIME ACCURACY GUARANTEED



FOR ABSOLUTE PRECISION IN THE FORMING OF GRINDING WHEELS: ANGLES, RADII AND THEIR COMBINATIONS AND PERFECT BLENDING OF RADII WITH TANGENTS . . .

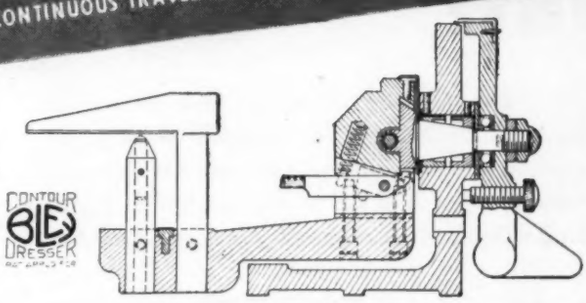
TYPICAL FORMS MADE ON A SURFACE GRINDER, WITH BLEY CONTOUR DRESSER WITH ARROWED LINES SHOWING EXTENT OF CONTINUOUS TRAVEL WITHOUT A CHANGE OF SET-UP.

Operates on a totally new and different principle! . . . Guarantees absolute precision and accuracy throughout the life of the fixture! Priced to meet the needs of the small shop—and priced so that purchase of several is practical for the larger shop.

1 **Precision is guaranteed for the life of the fixture. Guaranteed accuracy of repeated redressing of grinding wheels at a tolerance of less than .0005″**

2 **Even the most complicated "setup" can be made right on the bench.**

Capacity: grinding wheels up to 14″ in diameter. 3″ male and 3″ female radii. Total of 2″ lineal travel for angular work. Tangents: 1″ on either side of radius.



BLEY CONTOUR DRESSER

WITH 9 DIAMOND TOOLS

90° GOLCONE shaped point	$ 3.50
60° GOLCONE shaped point	4.00
CRYSTAL point	3.50
ELONGATED natural point	5.00
Rattail Tools For Semi-Circular Radii	
1/2″ Rattail, radii from 0.250″	$ 7.50
1/4″ Rattail, radii from 0.125″	7.50
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6 EXTENSION SLEEVES and 1 RATTAIL TOOL ATTACHMENT

ALL FITTED IN FINE HINGED WOOD INSTRUMENT CASE

PRICED COMPLETE

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Distributors: A few domestic and foreign territories still available

Oxygen Consumption...

DIDN'T GROW LIKE TOPSY

. . . because producers of oxygen have maintained continual research and development work in its application, to assure not only efficient and economical use of it in day to day operations, but to further new uses of oxygen for lower cost production of goods.

As a result of this, oxygen is an indispensable servant of all industry and will become increasingly important in the production era of the future.

Today Airco is using all its facilities to accelerate progress in research and development. Its technical staff, which introduced such processes as flame scarfing, flame gouging, flame cutting, flame cleaning, will, in the future, develop new and better applications of existing processes and, in addition, extend the use of oxygen to fields yet unexplored.

Airco looks to the future!

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An interesting booklet, "Oxygen—Indispensable Servant of Industry", is yours for the asking. Fill in the coupon, or write: Air Reduction, 60 East 42nd St., New York 17, N. Y. In Texas: Magnolia Airco Gas Products Co., Houston 1, Texas.

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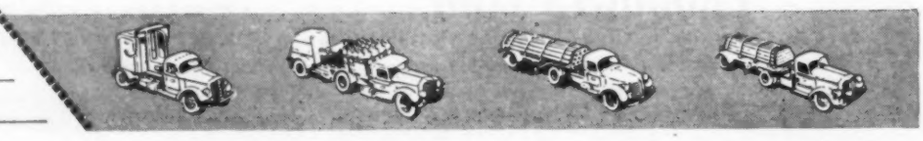
ORIGINATORS OF MODERN OXYACETYLENE METHODS FOR THE METAL WORKING INDUSTRY



HOW A DISSTONEER SAVED A MANUFACTURER $65,000 PER YEAR

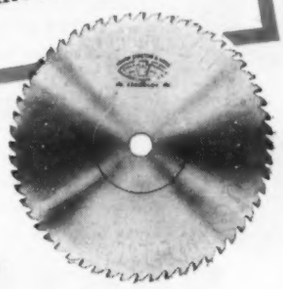
Savings in saw time	$ 1,560.00
Savings in saw stock	1,920.00
Savings in sharpening and magnaflux time	3,744.00
Gross savings one month	$ 7,224.00
Less cost of 8 carboloy blades	1,793.75
Net savings one month	$ 5,430.25
Net savings per YEAR	$65,163.00

It was on a job where extruded aluminum alloy stock, ¾" thick, was being cut with a power-fed saw. This job was requiring 12 saw changes for 10 hours' work.

A Disstoneer*, invited to study the problem, recommended the use of inserted section carboloy saws. On a test, 1275 pieces of stock were run off in 5 hours (one-half the former time) and the carboloy saw was still going strong without visible dulling. In this, as in many other cases, it proved its ability to hold close tolerances even to .0015".

The savings made by the use of these saws are impressive.

Another clear-cut case of Disston leadership



*DISSTONEER—a man who combines the experience of Disston leadership and sound engineering knowledge, to find the *right tool* for you—to cut wood, to cut metal and other materials—and TO CUT YOUR COST OF PRODUCTION—*not only on special work, but on ordinary jobs as well.*

You may have no need for inserted section carboloy saws, but like many others you may have an operation that can be performed better by the use of the—

DISSTON SKIP TOOTH BAND SAW

The skip tooth pattern, because of wider spacing, permits faster feeding without clogging. This is an exceptionally tough, hard-edged, flexible-back band saw designed for machines operating at speeds of 3000 f.p.m. and over. Recommended particularly for cutting aluminum and magnesium metal, but can be used with excellent results in cutting corrugated board, dry ice, meat, bone and other materials of similar natures.

HENRY DISSTON & SONS, INC., 320 Tacony, Philadelphia 35, Pa., U. S. A.

KNOW THESE VICTOR BENEFITS...

1 Keen, sharp teeth; hardened to cut deep and wear longer.

2 Accurate set provides ample clearance and accuracy of material being cut.

3 Finest grade of high speed steel, scientifically heat-treated gives VICTOR Blades longer wearing and cutting qualities.

4 Large, easy to read markings, on all VICTOR Blades make it a simple job to choose the correct blade type for every job.

5 Complete metal cutting instructions are given in this FREE VICTOR Metal Cutting Handbook. Send for a copy today. Victor Saw Works, Middletown, N. Y.

VICTOR

Makers of hand and power hack saw blades, frames and metal cutting band saw blades.

VICTOR UNBREAKABLE SPECIAL FLEXIBLE
10X½ .025-18 TEETH
VICTOR SAW WORKS, Inc., Middletown, N.Y., U.S.A.
U.S. PATENT NO.
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Announcing A NEW FLOATING TAP HOLDER

FLOATS TAP IN AND OUT

HERE'S a holder that will not freeze under tension caused by drag of tap.

It corrects both parallel and angular misalignment.

Because of those two features and because there are no springs or pivot members to restrict float, no bell mouths can occur and you're always sure of a straight hole. Close tolerances on tapped hole are easier to hold. Amount of float is infinitely variable and simply adjusted by lock nut.

AVAILABLE WITH STRAIGHT OR TAPERED SHANK IN FOUR SIZES:

2" body for standard taps, 3/16" to ½" incl.
2½" body for standard taps, ½" to 1¼" incl.
3" body for standard taps, 1¼" to 1¾" incl.
4" body for standard taps, 1¾" to 2½" incl.

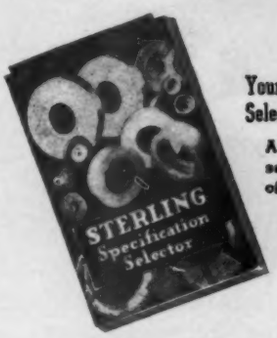
EMPIRE TOOL COMPANY
8774 GRINNELL AVE.
DETROIT 13, MICH.

HERE'S WHY THESE CHUCKS AND SEGMENTS TURN OUT BETTER JOBS

With the patented Sterling No. 2 Chuck, each segment is mounted separately, every grooved abrasive unit fitting into its proper position. With a simple twist of the socket wrench, segments can be tightened and remain solid throughout their long life, regardless of the type of material being ground. Smoother operation, better finish, no chatter marks—these are natural results of Sterling's safe, rigid fastening of the segments by the chuck.

Sterling No. 2 Segments are not gap-type. There is no dangerous open space between them. The patented, interlocking design of these segments means added strength throughout the entire abrasive ring . . . provides cooler, faster grinding at lower than usual cost.

Take advantage of Sterling's time-saving, money-making continuous shearing action which these chucks and segments provide. Full information upon request.



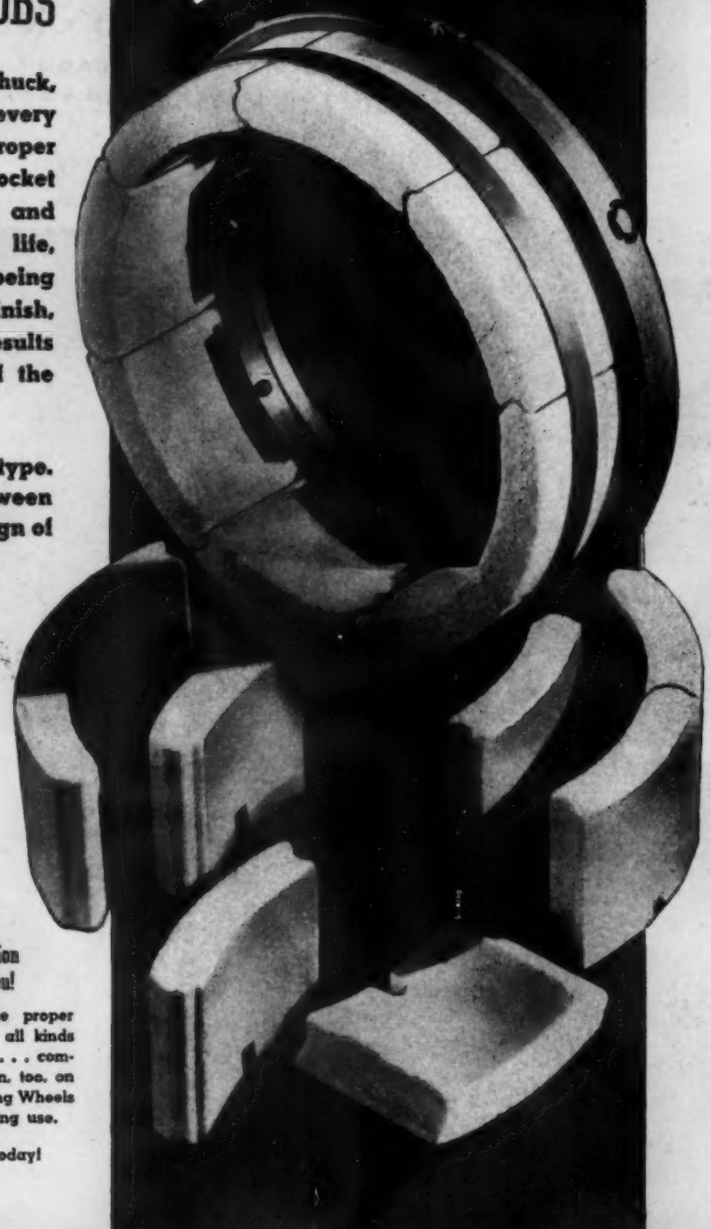
Your Sterling Specification Selector is Ready for You!

A full listing of the proper segments to use for all kinds of surface grinding . . . complete information, too, on the use of Sterling Wheels for every grinding use.

Send for it today!

Sterling

"THE WHEELS OF INDUSTRY"



• STERLING ABRASIVES •

THE STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

KALEIDOSCOPIC

The diversity of form and of application of tool steels is wide. For many years changing demands have been more than met by Midvale's versatile experience. This experience is not static . . . but an always-growing compound of time and knowledge. Accordingly, tool steels of whatever composition for whatever old or new applications, are best made by Midvale hands under Midvale laboratory guidance. Straight Carbon Tool Steels—Alloy Die Steels—Shock Resisting Steels—High Speed Steels—special grades for special purposes—all these are available. And all uphold the Midvale reputation.

THE MIDVALE COMPANY • NICETOWN • PHILADELPHIA

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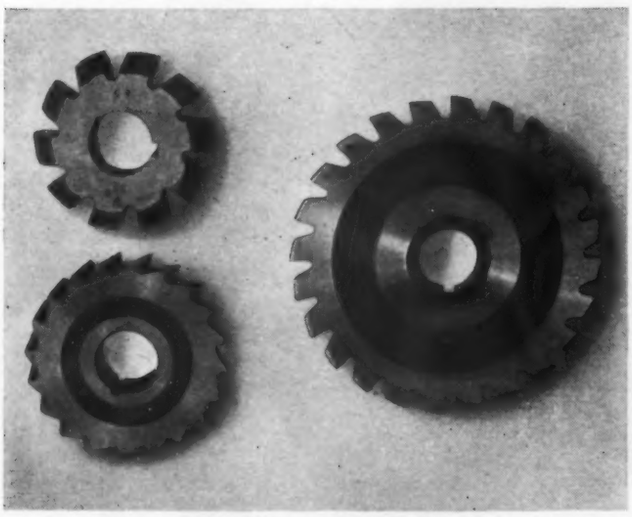


MIDVALE
Custom Steel Makers to Industry

One of eight plants to retain original Navy "E"

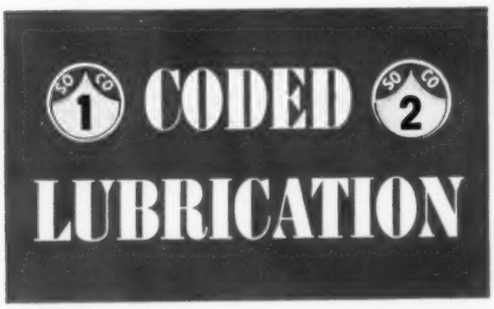
Two services that help you to lower lubrication and maintenance costs

TWO HELPFUL services described at the right are offered by Standard Oil to manufacturers in the Middle West. They are designed to take guess work out of plant lubrication. First, by providing experienced Lubrication Engineers to help you choose the right lubricant for every application. Second, by insuring that the *right* lubricant is applied in the *right* places by means of a coded lubrication system. You can get both of these services by writing Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, and asking for the Lubrication Engineer nearest you.

Lubrication Engineering Service

Standard Oil has experienced Lubrication Engineers located in principal cities throughout the midwestern states shown on the map.

These Engineers have two advantages when analyzing your lubrication needs. They are familiar with the operation of all types of plant equipment—as are your plant personnel—and they have a complete knowledge of the lubricants available to meet your requirements. Thus Standard Oil Lubrication Engineers can help you *get the right lubricant.*

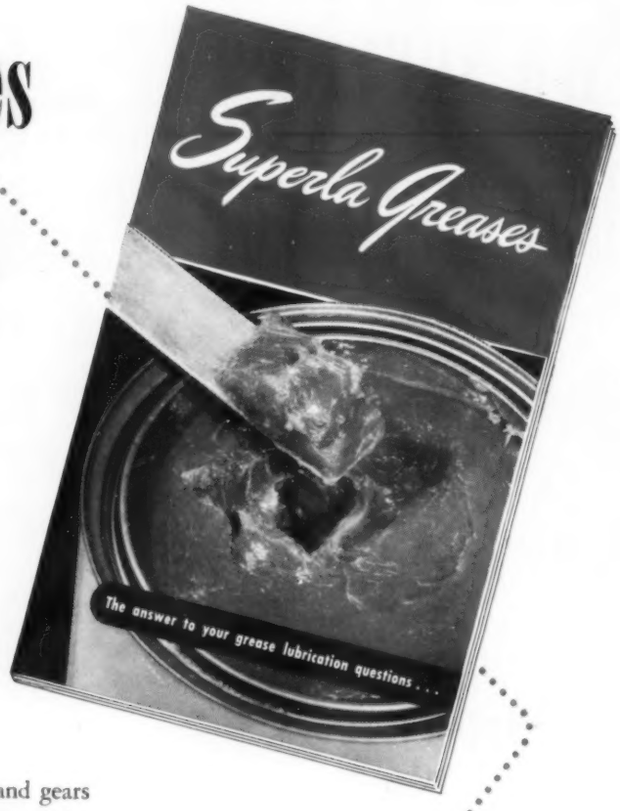


In addition, these Engineers can supply you with a simple Coded System for applying lubricants. Briefly, the system provides for numbering all lubricants used in your plant. Every drum, oil can, or grease gun used for dispensing lubricants is identified by a number to indicate the lubricant it contains. Each spot to be lubricated is also marked by a number to indicate the lubricants required.

Your oilers follow the code numbers. The *right* lubricant is applied to the *right* places every time.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

What qualities to look for in cost-saving greases



QUALITIES that reduce wear on bearings and gears . . . that stop excessive consumption . . . that cut oiler time for servicing equipment . . . these are the qualities you want in a grease. What they are and how you can get them is described in a booklet illustrated at right.

Many of the advantages, which you would expect to find only in special purpose, premium priced greases, are available in a line of 11 grades—including high-temperature greases—called

SUPERLA GREASES

Send for this Booklet

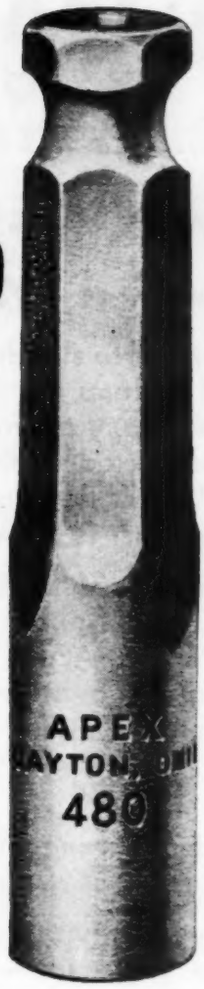
It tells how the most desirable qualities have been incorporated in a complete line of grease to reduce costs on a wide range of Industrial application.

It also has hints on hand packing anti-friction bearings and avoiding over-lubrication.

You can get a copy from the Standard Oil Industrial Service Representative who calls on you or by writing Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

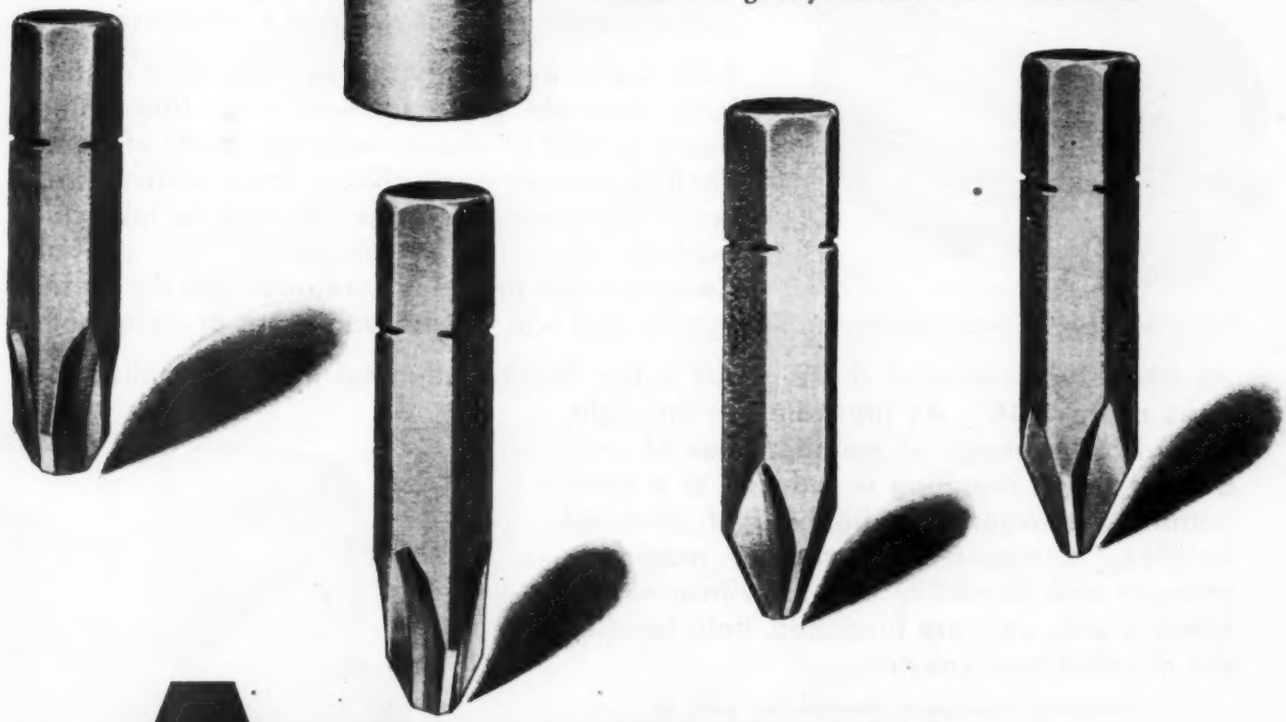
STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

How to make 1=4



One Apex bit holder makes up to four Phillips screw drivers with the simple addition of Apex money-saving insert bits. One range of inserts (four Phillips point sizes) fits various holders, simplifies your inventory, saves returning bits for reconditioning. You obtain the desired holders, then simply stock inserts for replacement needs.

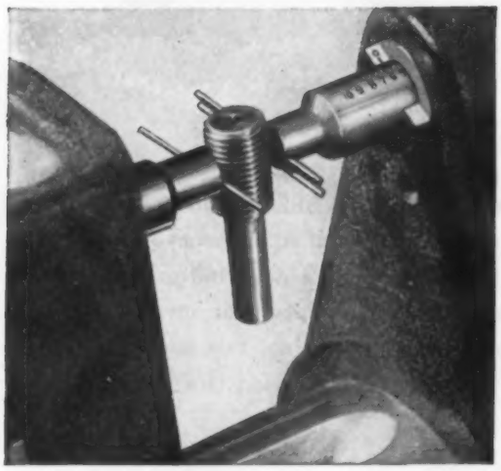
Bits float in holders, allow easier alignment with screw recesses, wear longer. Holders furnished for practically all makes of power, spiral and hand drivers. Bulletin 102 gives you all the facts. Write for it.



APEX INSERT TYPE BITS

THE APEX MACHINE & TOOL CO. • DAYTON 2, OHIO

TWO *New* APPLICATIONS OF CARBOLOY CEMENTED CARBIDES To LINCOLN PARK GAGING EQUIPMENT

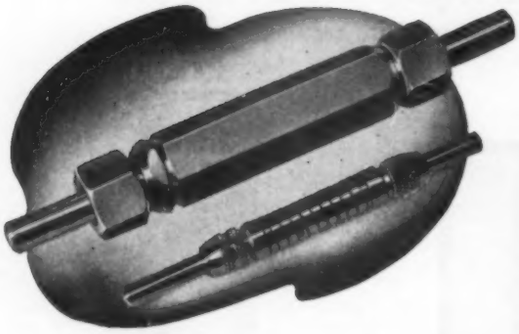


Thread and Gear Measuring Wires

Ground and lapped to standard tolerances closer than National Bureau of Standards specifications. Retain accuracy at least fifty times longer than can be expected of the best steel wires. Possibility of "flats" developing, with resultant inaccurate readings, is eliminated.

Wires for N. S. 4 to 36 pitch are available from stock. Wires for other pitches, Whitworth, British Association, Metric, Acme, worm threads and gear wires can also be supplied with prices being quoted upon request.

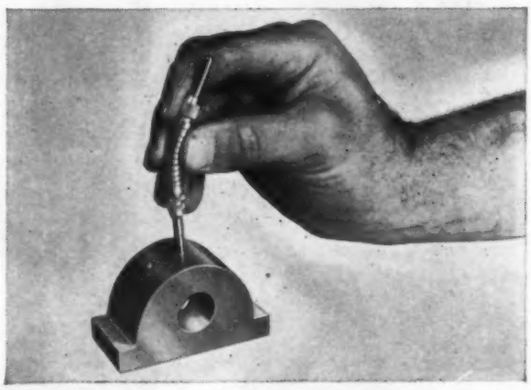
Wire Type Plug Gages



Produced in a size range from .025" to .375" and are made to Class XX, and X tolerances.

Solid Carboloy wire type gage members assure long, accurate gage life—at least fifty times that expected of similar members made of steel. Their wear-resistance allows users to disregard wear allowance for gage life and to take advantage of full print tolerances. The use of Carboloy also provides assurance that the members will be non-corrosive, non-magnetic and will not become bent or deformed.

An exclusive feature of these gages is the flexible all-metal handle supplied for sizes up to 3/16". As illustrated at the right, hazard of breakage of members due to accident or rough handling is reduced to a minimum. In the larger sizes, lightweight, all-metal handles, designed to provide maximum strength and durability and to withstand the effect of oils, etc., are furnished. Both handles are of collet type construction.



Completely descriptive bulletins on both of these new Lincoln Park Products will be sent you upon request. Write for your copies today.

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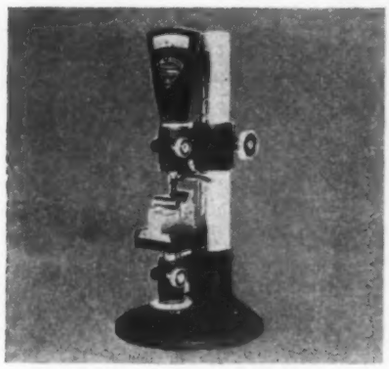
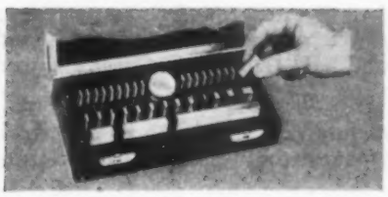
SPENCER BINOCULAR MICROSCOPE
Permits three-dimensional vision at high magnification in inspecting small parts, contours, surface finish, etc. Choice of objectives, 7x to 8x and of eyepieces, 9x to 18x.

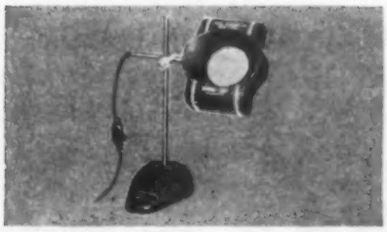


SCHERR COMPARITOL
Gives visual, magnified readings to 1/10,000". Checks gage blocks, plugs, other tools for wear. Rapidly checks volume production of small parts without dependence on skill or "feel" of operator.

WILDER MICRO PROJECTOR
Throws magnified shadow image of work for comparison with master drawing. Most accurate way to check small parts, threads, gears, odd forms. Ideal for checking tool wear on screw machines by periodical inspection of work.



ULTRA CHEX GAGE BLOCKS
Accurate within .000008". A sound basis for building the accuracy standards of the entire shop. Large and small sets, to meet all requirements.



SCHERR MAGNI-RAY
Magnifies work under inspection and floodlights it with rays shielded from operator. Three models widely used for inspection.

"TWO STRIKES IS OUT, IN THIS GAME," SAID THE WORKS MANAGER—"any sub-contractor whose work we have to reject *twice*, is off the list for keeps."

"You mean the Smith outfit?" asked the Purchasing Agent.

"Yes—this is the second lot of their work that is not up to specification. They try hard, but they're not using modern measuring methods. Consequence is too many rejections, too many arguments, too many upsets in our own production schedule because needed parts are held up."

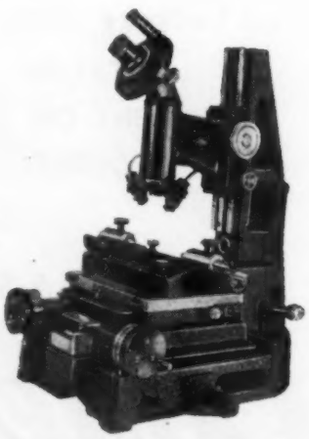
"Now take the Bright people—their work always checks up. They are not a big shop, but they must have fine inspection equipment. Better see if they can take a larger chunk of our work. Give them all they can handle."

The Purchasing Agent chuckled, "I was talking to Mr. Bright only the other day," he said, "It seems they have one of those 'Scherr Limited Budget Inspection Laboratories', and Bright said it had become his best salesman, because of the contract work they were getting on the basis of the precision they could guarantee. Said they were using accuracy standards right up with the big modern shops, with optical parallels to check spindle ends and anvils of micrometers, a Wilder Projector that throws a magnified image of a contour against a master drawing, a Spencer Binocular Microscope that enables two-eye seeing with the object lighted from the side, and several other instruments. Bright says this equipment is the best investment he ever made."

"That's the kind of shop we want on our work," said the Works Manager. "Give them all they'll take."

GAERTNER TOOLMAKERS' MICROSCOPE

For rapid precision checking of critical dimensions, angles, contours, etc. A scientific laboratory instrument with the rugged strength of a manufacturing tool. Valuable in both tool room and inspection department.



GEO. SCHERR CO., Inc. 201 LAFAYETTE STREET NEW YORK 12, N. Y.

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1 Union Street, Westboro, Mass.

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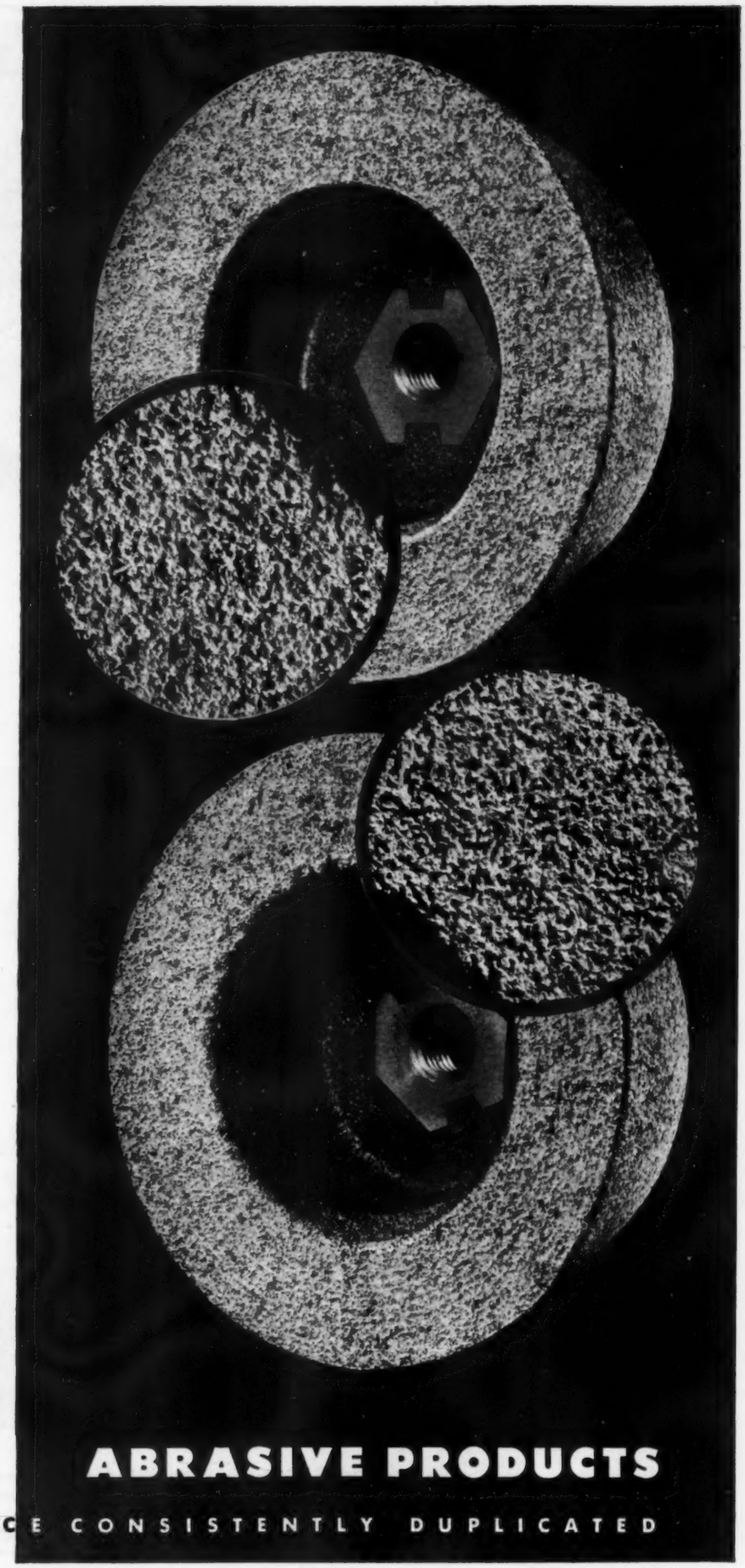

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PROVED...and APPROVED

Proved on the toughest as well as on the most delicate of jobs... and their performance *approved* by workers who take pride in grinding perfection and by management with an eye on output and costs... that's the record of SAFETY Grinding Wheels over many years in foundries and machine shops everywhere!

And the reason? Wheels expertly designed and fabricated for the specific work they are to do, PLUS size, grain and grade tested to give utmost accuracy, cutting speed and smoothness of finish.

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That's why it's so important to make sure that they are protected by superior lubricants — by Gargoyle Greases BRB. These carefully compounded greases form strong films over highly polished surfaces for maximum protection against wear, rust and corrosion. They resist oxidation and separation, seal out impurities and reduce leakage to a minimum.

Two grades of Gargoyle Greases BRB are customarily used for anti-friction bearings . . . No. 3 for all ball and roller bearings operating under normal conditions . . . No. 4 for anti-friction bearings at high temperatures or high speeds.

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- **CELFOR CARBIDE CUTTING TOOLS . . .** new members of the Celfor family, to make the first complete line offered by a single manufacturer.

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NELCO Carboloy-Tipped CUTTING TOOLS

TAGGED FOR *Faster* **PRECISION Production**

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HEAVY, RUGGED BRAZED-IN TYPE WITH HIGH-STRENGTH BODIES

70% INCREASE IN NUMBER OF PIECES MACHINED PER GRIND

End Mill With #50 Taper Shank

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DESIGNED FOR FLYWHEEL ACTION

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End Mill—Two and Four Flute Straight and Taper Shank

ALL CARBOLOY TIPPED END MILLS REDUCED 10% IN PRICE!

SAVE Hundreds of Valuable PRODUCTION HOURS By Giving The NELCO FIELD ENGINEER A Few Minutes Time!

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Carbide Tipped and High Speed Steel

TODAY, lowering production cost is a basic necessity for profitable manufacturing. It is here that Midwest's experience, facilities and engineering ability can assist you in selecting metal cutting tools to reduce your production costs. Midwest has been designing and manufacturing standard as well as highly-engineered, special application cutting tools for 35 years.

Send us the details of your metal cutting problems; let us assist you in selecting tools to solve them and lower your manufacturing costs. Efficient tooling means profitable production. Write us today.

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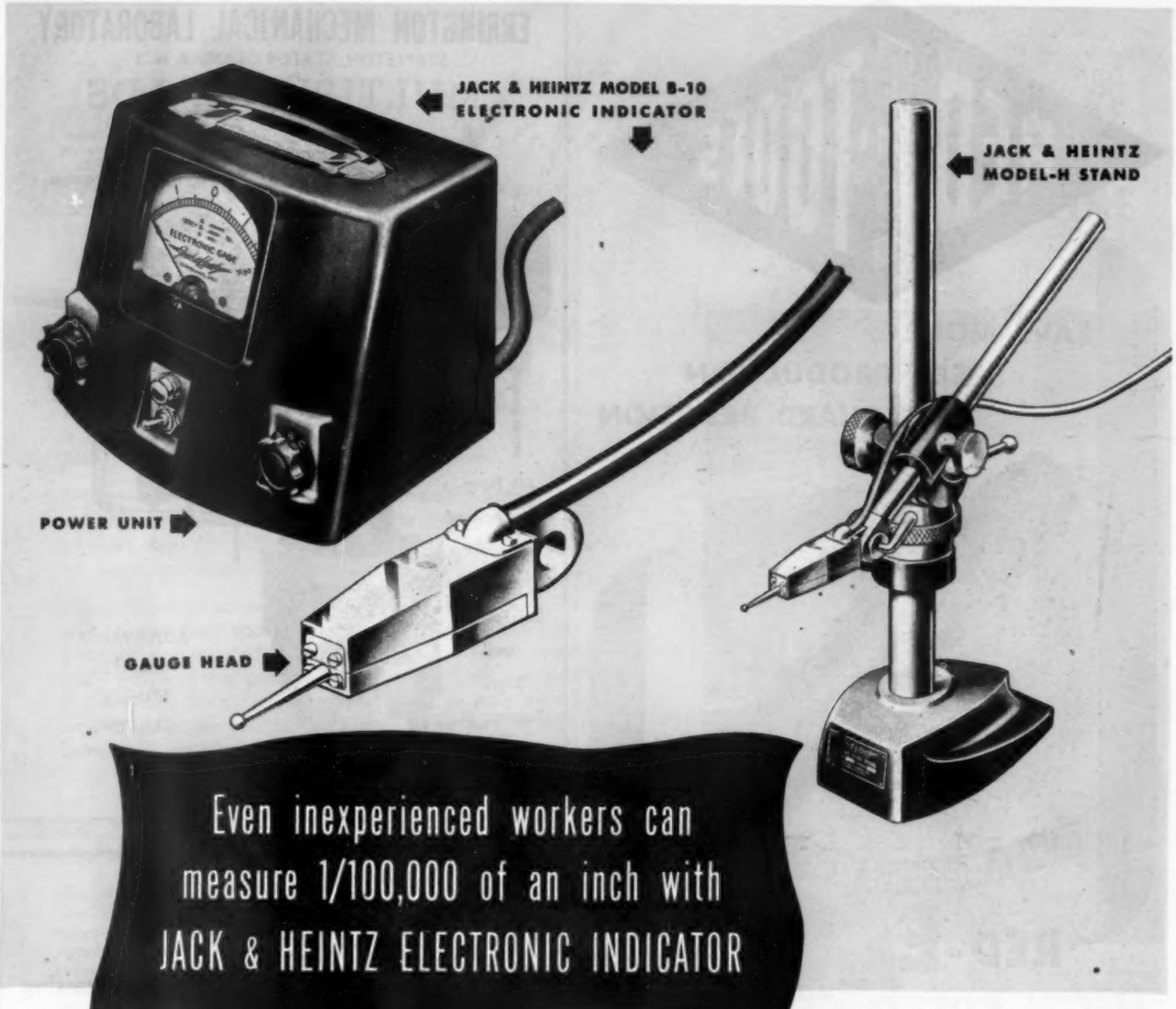

Even inexperienced workers can measure 1/100,000 of an inch with JACK & HEINTZ ELECTRONIC INDICATOR

THE SMALLEST PART on your production line can be quickly and easily measured to an accuracy of 1/100,000 of an inch by an inexperienced operator using the Jack & Heintz Model B-10 Electronic Indicator mounted on a Jack & Heintz Model H Height Gage Stand.

Absolutely foolproof, the indicator head is small and tapered for entrance into extremely small spaces, has only one moving part, and can be mounted on many gaging fixtures that were originally designed for mechanical indicators. It has no mechanical linkage or friction pivots to wear out. Despite its ruggedness, the gaging point puts a feather-touch of only one ounce on the work, and indicators with even lighter contact pressures can be built for special applications.

The amplifying circuit in the power unit of the indicator limits power intake, protecting the instrument from damage due to oversize parts. "Warming up" errors are avoided and correctly balanced design makes accuracy of the power unit independent of ordinary voltage fluctuations. A flutter-free needle gives a "dead beat" positive reading, eliminates all guesswork and minimizes operator eye fatigue. The most sensitive instrument of its kind available, the Jack & Heintz power unit has a single rotary selector switch that makes three ranges of magnification available in multiples of ten (9400:1, 940:1 and 94:1) providing unit graduations of 1/100,000, 1/10,000 or 1/1000 respectively. Other magnifications available on special order. (The operator is compelled to bring instrument needle to scale when sensitivity is changed before he can resume work, thus avoiding error due to carelessness.)

The Model H Height Gage Stand provides a rigid, easily adjusted support for the indicator. Although it was specially designed for the Model B-10 Electronic Indicator, it will handle equally well any gage having a standard AGD mounting lug. An outstanding feature of the stand is the vertical fine adjustment, operated by turning the large knurled ring on the swivel assembly. The knurled ring operates on precision spring-loaded differential screw threads and gives perfect control of the gaging point.

Learn more about the Jack & Heintz Model B-10 Electronic Indicator (power unit and gage head) and the Model H Height Gage Stand. These precision instruments can speed production, improve accuracy, cut costs on many production lines. Write for your FREE copy of the booklet entitled, "Electronic Gages."

JACK & HEINTZ, Inc.
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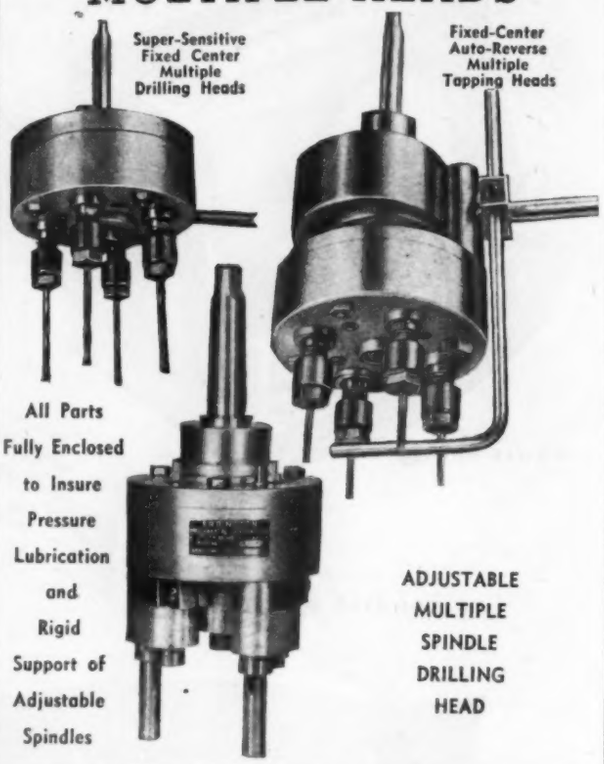
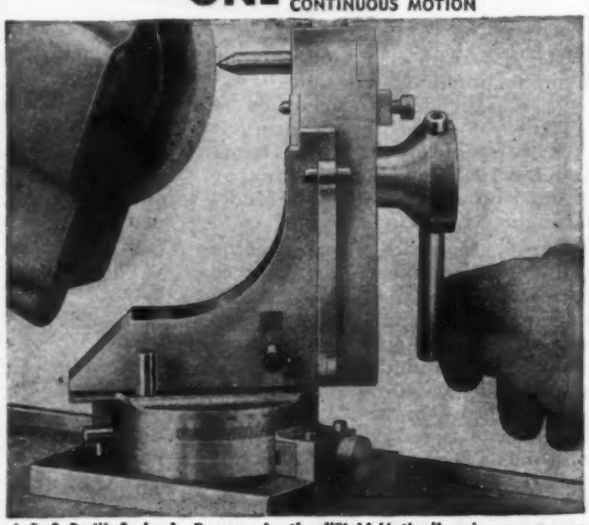
MULTIPLE HEADS


Super-Sensitive Fixed Center Multiple Drilling Heads
Fixed-Center Auto-Reverse Multiple Tapping Heads
All Parts Fully Enclosed to Insure Pressure Lubrication and Rigid Support of Adjustable Spindles
ADJUSTABLE MULTIPLE SPINDLE DRILLING HEAD

USE *Fluid-motion*
for modern form-dressing
ONE SETTING HANDLE CONTINUOUS MOTION



J & S Radii & Angle Dressers in the "Fluid-Motion" series are among the finest precision dressing instruments procurable. . . . regardless of cost. There is a standard model to fit most form-dressing requirements.

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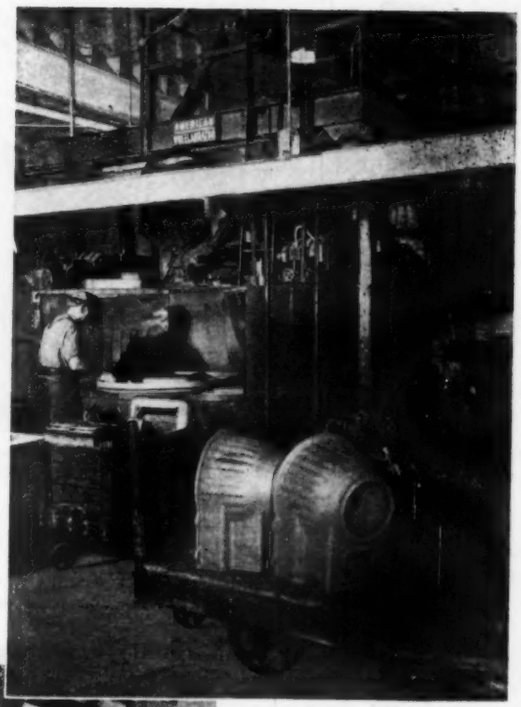
AIRLESS *Wheelabrator* CAN REDUCE YOUR *Waste* LINE

The size of your plant "waste" line directly affects not only the size of your profits but also your ability to compete on a favorable basis.

A frequent contributing factor in swelling expense bulges is inefficient cleaning . . . a condition that nearly 3000 plants have solved with Airless Wheelabrators.

This modern cleaning method is extremely fast, economical and efficient. The Wheelabrator unit throws a storm of more than 280,000 shot or grit per second that no sand or scale can resist.

Result: Unusual savings in time, money, manpower, horsepower, and floor space . . . a minimum of breakage . . . products are scoured lustrously clean . . . faster machinability with less tool grinding . . . simplified work-inspection. If these are the advantages you want in your own business let us show you in black and white how a Wheelabrator will quickly pay for itself out of savings.

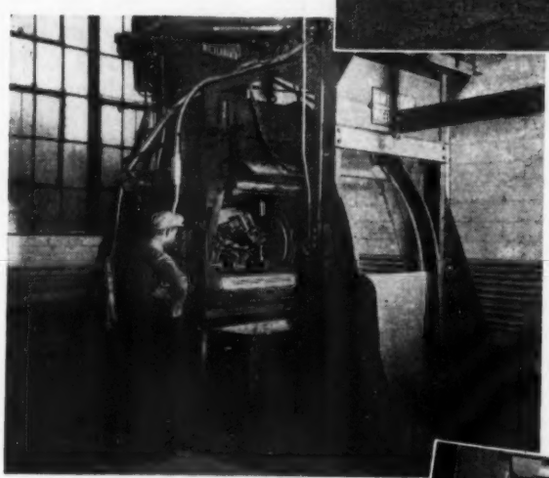


HOW IT WAS DONE AT GUELPH STOVE COMPANY

Guelph Stove Company, one of the leading Canadian manufacturers of stoves and furnaces, eliminated costly waste in the cleaning room by installing a No. 3 Wheelabrator Table and a 27" x 36" Wheelabrator Tumblast to handle their entire production.

In addition to removing sand from castings in the green stage, both machines are used for cleaning preparatory to enameling. (See illustrations at right.)

Twelve tumbling mills were eliminated . . . breakage of fragile stove parts became a thing of the past . . . production capacity was increased using only a fraction of the former floor space . . . and cleaner working conditions were maintained.



A one-minute cycle through the No. 3 Wheelabrator Table is sufficient to remove foundry sand from stove plate and furnace castings. Many tons of castings of the type shown in the picture above are cleaned daily in the rough stage and prior to enameling.

This 27" x 36" Wheelabrator Tumblast, operating nine hours daily, cleans all of the small stove and furnace parts. Loads weighing several hundreds of pounds each are cleaned in from two to six minutes.

Notice the bright, clean, silvery appearance of the Wheelabrated castings in the conveyor of the 27" x 36" Wheelabrator Tumblast. This load of gray iron castings was cleaned in just four minutes.

American
FOUNDRY EQUIPMENT CO.

317 S. BYRKIT ST.
MISHAWAKA, IND.

WORLD'S LARGEST BUILDERS OF AIRLESS BLAST EQUIPMENT

OUT OUR WAY

HERE, HERE! WHAT DOES THIS MEAN?
ASK HIM-- HE KNOWS! HE'LL TELL YOU ALL ABOUT IT-- I'M NOT TALKIN'!
WHY, THAT DUMB FAT-HEAD! KICKIN' THAT KID RIGHT IN FRONT OF TH' BOSS!
YEH, DUMB LIKE A FOX! THREE TIMES THIS WEEK HE TOLD TH' KID TO SPREAD SPEEDI-DRI UNDER HIS MACHINE, BUT TH' KID DIDN'T DO IT--SO HE WAITED UNTIL HE SAW HIM WITH TH' BOSS SO NO ONE CAN SAY HE'S A RAT, SQUEALER, ER TATTLE-TALE! TH' KID WILL DO HIS OWN SQUEALIN'!
T. M. REG. U. S. PAT. OFF. COPR. 1946 BY NEA SERVICE, INC.
DIRECT ACTION
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Men who work with machines *like* SPEEDI-DRI . . . they *know* the danger present when floors are glaze-slick with oil- and grease-deposits, just waiting for an unwary step. They like SPEEDI-DRI because it lays a carpet of safety underfoot . . . making all types of floors safe for walking, safe for working. And when SPEEDI-DRI is swept-up, it takes with it all grease- and oil-sludge. In time, it will bring up even ancient deposits . . . leaving floors as clean as an old maid's kitchen.

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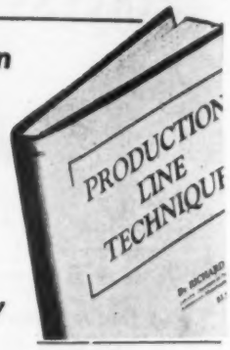
for precision quantity, low cost in small industry



This book gives you the fundamentals of production line technique—how it differs from job-lot manufacture, its advantages and limitations, how production lines may be set up and successfully operated in medium-sized industries. Based on first-hand field investigations of current practices in many manufacturing plants. A sound, practical guide to the steps to follow in design, procedure, equipment, and maintenance of production lines . . . the pitfalls to avoid . . . and the special features to consider, in establishing smooth-running, well-balanced, *profitable* production lines.

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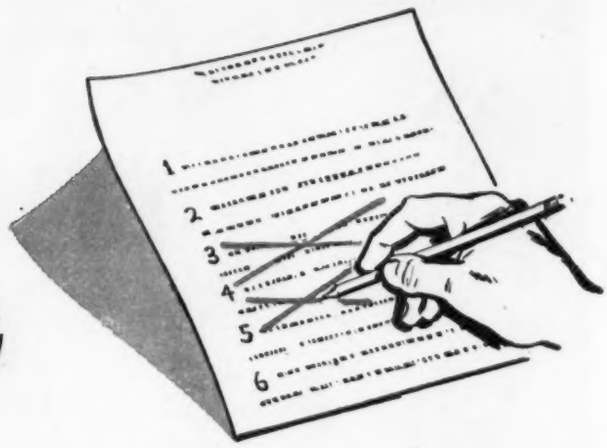

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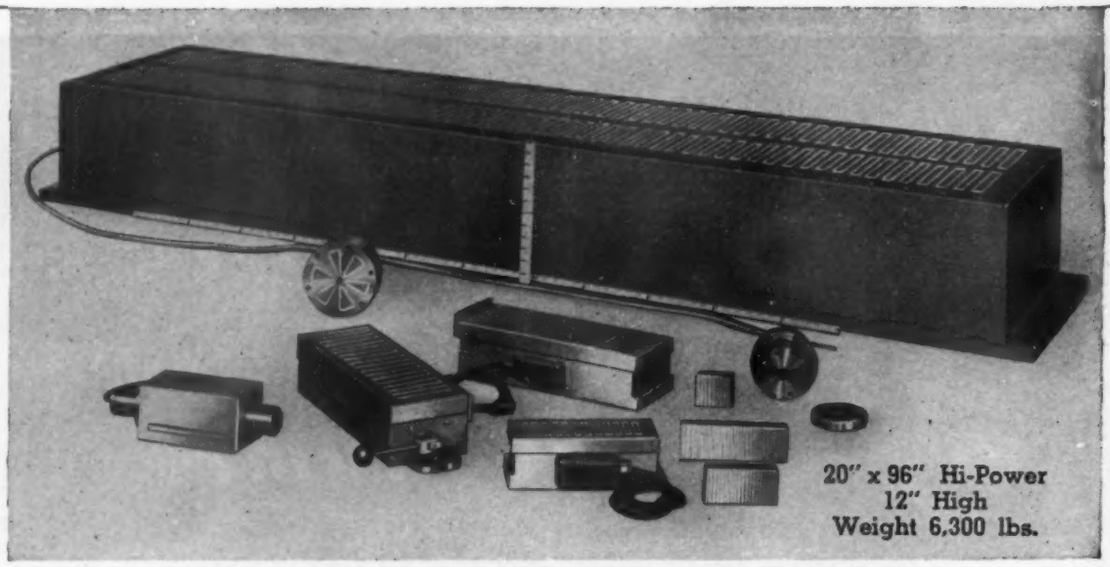

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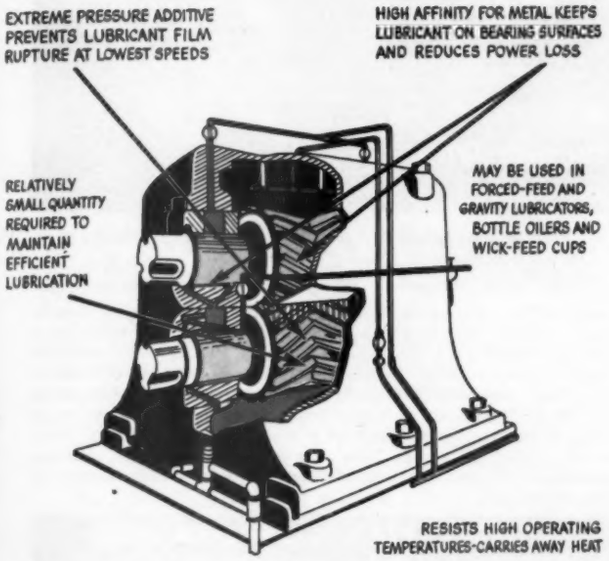
STANDARD ENGINEERS NOTEBOOK

CALOL RPM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RESISTS HIGH OPERATING TEMPERATURES-CARRIES AWAY HEAT

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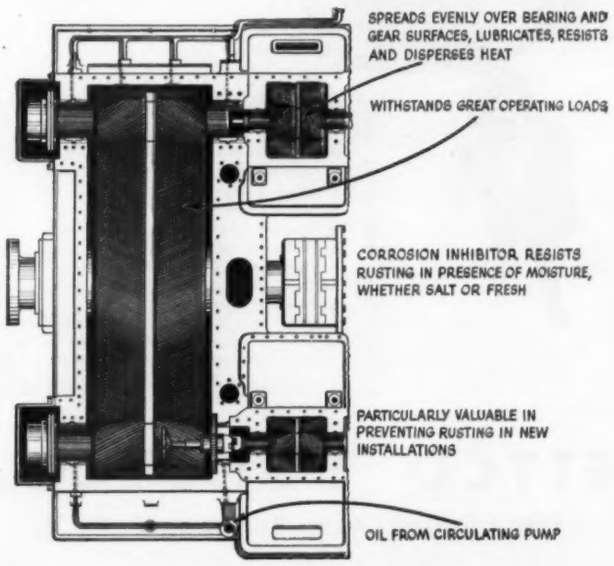
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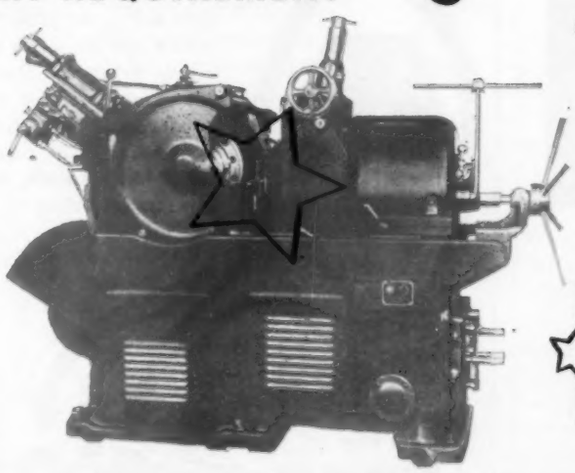

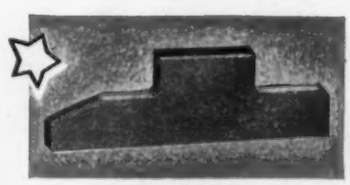

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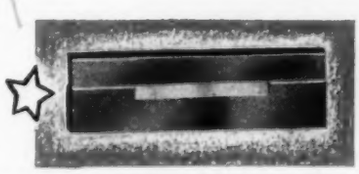

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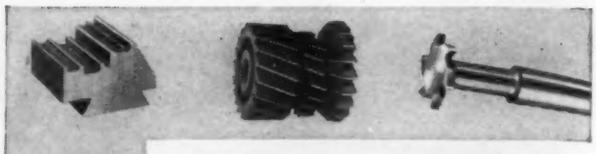

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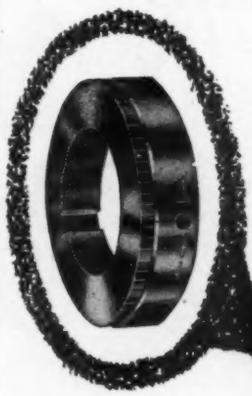
MICROMETER ADJUSTMENT
on side milling cutters and gang milling setups with Dayton Rogers Micrometer Adjustable Spacing Collars



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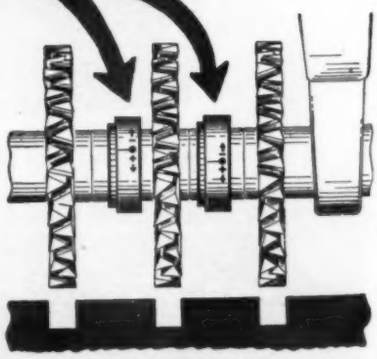

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They even made a TASTE TEST of a SHELL RUST PREVENTIVE!

PROBLEM: Specifications in contract for making U. S. Army cooking kettles called for a protective coating that came off easily with cold water. Absolutely no taste or odor could remain. The manufacturer preferred a coating to be applied by dipping at room temperature.

SOLUTION: When the Shell Lubrication Engineer surveyed the problem, he recommended a Shell Ensis Oil. As a test, this material was applied to utensils of the plant cafeteria. These were washed in cold water—then placed in normal use. *Not one employee could detect the slightest trace of the Rust Preventive used.*

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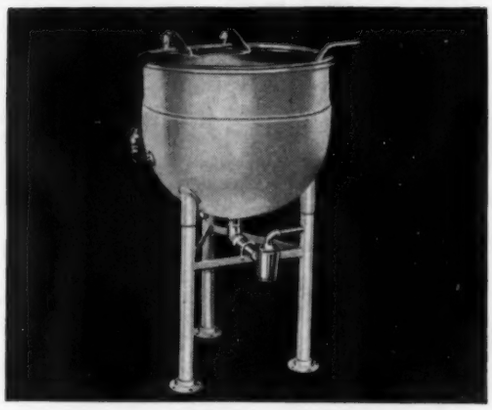

No one really cares what a Rust Preventive tastes like, but the maker of U. S. Army cooking kettles had to be sure that the Rust Preventive could be completely removed *so that it would not taste!*

SHELL RUST PREVENTIVES

OILS . . . FLUIDS . . . COMPOUNDS

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ASTE

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3. New ideas by the hundred will be shown *for the first time* at the ASTE Exhibition.

4. Here is every production man's opportunity to see how the latest production methods and tools will help solve the shop problems of today and tomorrow.

5. Remember the date—April 8-12, 1946—and the place—Cleveland's Public Auditorium.

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Temper 2-4 hours to hardness specification. (1000° F. minimum). Allow tool to cool to 150° F.

Cold treat to −120° F., in Deepfreeze Chilling Machine for 3-6 hours, depending on cross-section. Allow part to return to room temperature normally. Repeat tempering cycle, using 25° F. lower temperature for 2-4 hours.

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Find out how cold treating can be put to work in your plant; how it will enable you to attain greater production economies, conserve valuable time and noticeably improve the quality of your products. You can determine the exact results of cold treating without cost by contacting Deepfreeze Engineering Service. Our staff of industrial refrigerating experts will make a complete survey of your production setup and inform you of the specific results you can expect.

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100% Increase in Hob Life after Cold Treatment in a Deepfreeze

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From 1500 to 4500 Pieces per Grind

300% Increase in Cutter Life after Cold Treatment in a Deepfreeze

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A Complete Engineering Handbook on INDUSTRIAL COLD TREATING

This 42-page Deepfreeze handbook contains all of the data you need to put cold treating successfully to work in your plant. It includes a number of the better procedures, actual results attained by following them, a list of Deepfreeze users and numerous other extremely useful facts. Write today for your free copy.

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TO 60%-80% OF YOUR CARBIDE NEEDS

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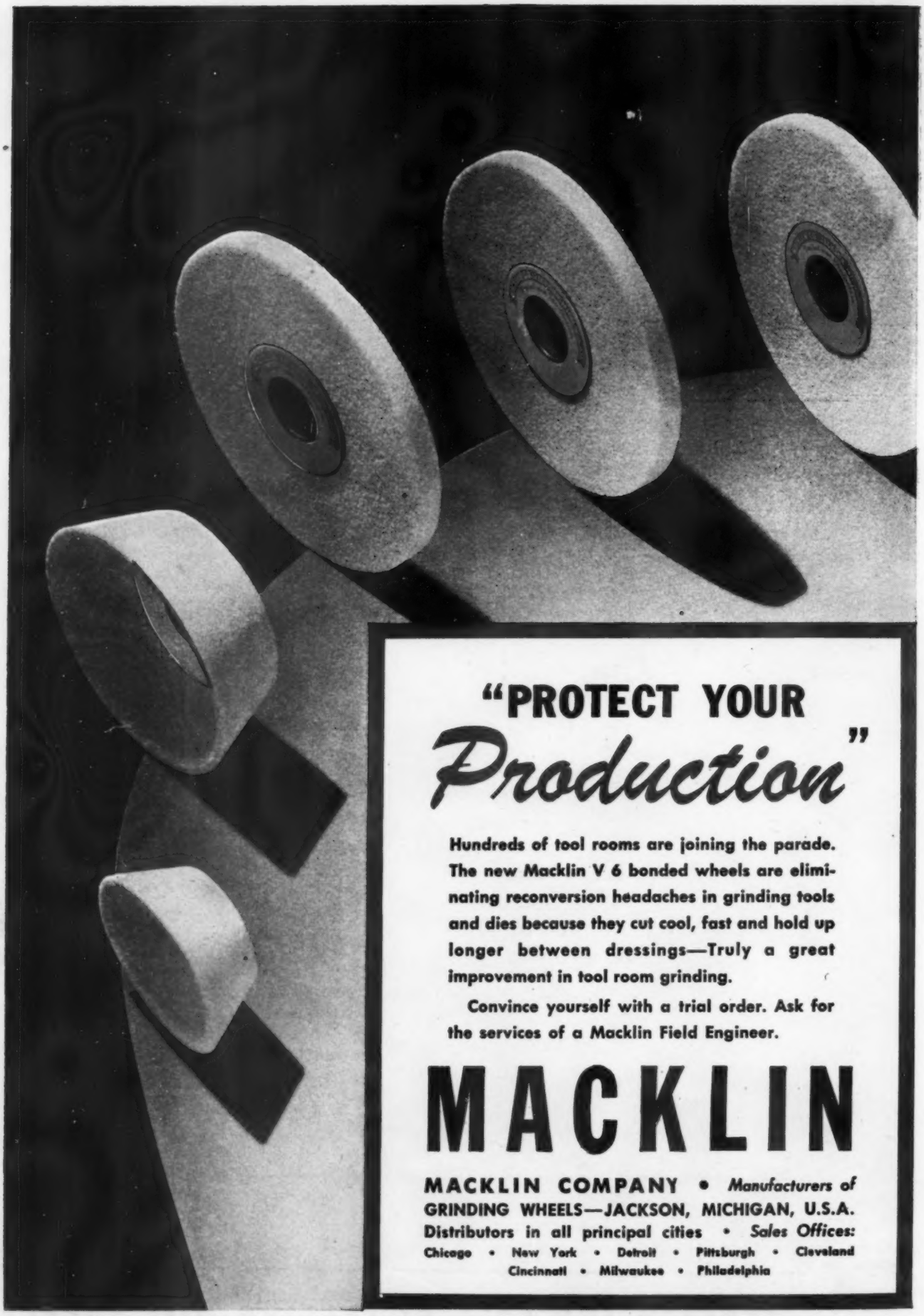

"PROTECT YOUR *Production*"

Hundreds of tool rooms are joining the parade. The new Macklin V 6 bonded wheels are eliminating reconversion headaches in grinding tools and dies because they cut cool, fast and hold up longer between dressings—Truly a great improvement in tool room grinding.

Convince yourself with a trial order. Ask for the services of a Macklin Field Engineer.

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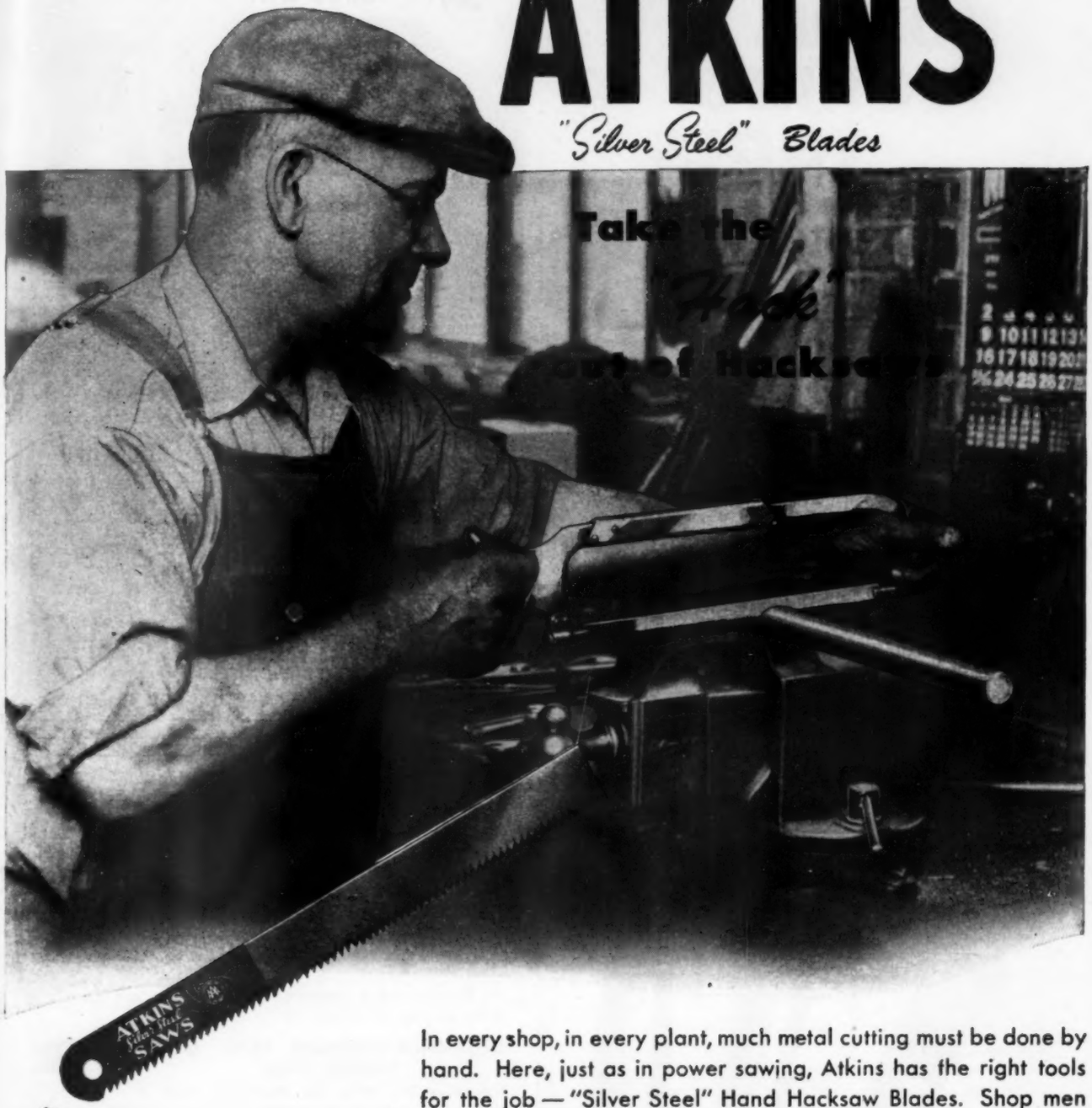
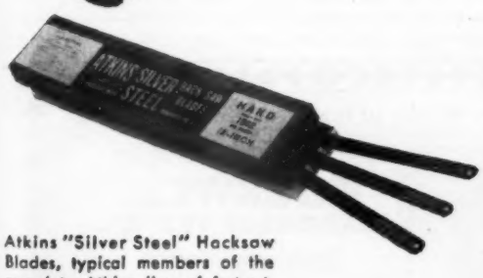
ATKINS

"Silver Steel" Blades





Atkins "Silver Steel" Hacksaw Blades, typical members of the complete Atkins line of fast-cutting long-performing saws for every cutting job.

In every shop, in every plant, much metal cutting must be done by hand. Here, just as in power sawing, Atkins has the right tools for the job — "Silver Steel" Hand Hacksaw Blades. Shop men equipped with these blades are bound to do better work at lower time and tool costs. Tough, keen teeth that take a deep bite of metal at every stroke . . . blades that stand up and need less changing . . . these are points that make a good workman better.

Decide now to get acquainted with the "Silver Steel" story at the first possible opportunity.

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402 S. Illinois St., Indianapolis 9, Indiana
AGENTS AND DEALERS THE WORLD OVER

Makers of Better Saws for Every Cutting Job
POWER AND HAND BLADES • MILLING SAWS • SEGMENTAL COLD SAWS • METAL CUTTING BANDS

BOKUM BORING TOOLS

bring you many advantages

★ Helical relief maintains constant clearance angles entire life of tool.

★ Finish lapped cutting surfaces produce better bores with faster feeds.

★ Resharpening confined to one face.

★ Down time for regrinding reduced.

★ Unskilled help can use tools without loss of efficiency.

Send for catalog that shows all sizes and prices. Ask for No. K-1139 for super high speed tools and for No. K-398 for carbide tipped tools.

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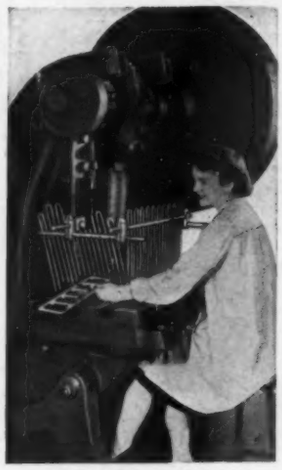
Save hands with STRANDS



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BIG AIDS TO INCREASED PRODUCTION

Easily attached to the press. Gates can be instantly adjusted. Staples movable up or down for close adjustment to die or for straddling any obstruction. Guard can be decreased or increased in size to accomodate dies. Write for Bulletin "PRODUCE WITH SAFETY"—shows application and simplicity.

Sweep arm movable up or down when setting die. Can be adjusted in or out from press or higher or lower without detaching. Starting point is adjustable—stopping point always the same. Can be operated right or left handed. Shield prevents operator from working back of guard. Bulletin gives complete details—write for copy.

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SAFETY ENGINEERS
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GRINDING WHEEL DRESSER

Desmond Cutter

Desmond Hex Dresser

We manufacture a complete line of Dressers and Cutters. Write for copy of catalog "A".

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"ROCKWELL" HARDNESS TESTER

Now and always made only by

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Thousands of these industry-tested Automatic Transporters have been making sensational performance records in every kind of business. Increased production now makes it available to *you*. But for a while the order will have to be "First come, first served!" Mail the coupon so that we can hurry you the complete facts.

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Please mail me, without cost or obligation, complete facts about AUTOMATIC TRANSPORTER, the Miracle Electric Truck . . . plus *proof* that it will cut my handling costs in half.

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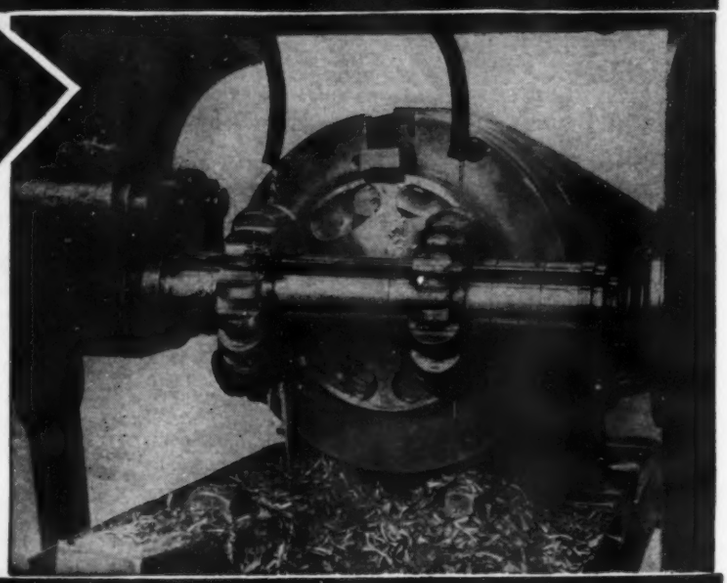
The HARTFORD SUPER-SPACER

. . . making an easy job out of a difficult milling operation



The part shown—an airplane engine component—is being held by a guide-clamping fixture operated by a hand wheel at the back of the SUPER-SPACER. Indexing on this rough milling operation is conveniently handled by the SUPER-SPACER in the conventional way, mask plates insuring correct spacing and rapid indexing.

This application—one of many possible with the HARTFORD SUPER-SPACER—shows how a difficult problem can be solved. We suggest, therefore, that you submit your unusual indexing jobs to our engineers for study and ask for our recommendations as to how the HARTFORD SUPER-SPACER can be applied to meet your needs.

Send at once for literature showing the HARTFORD SUPER-SPACER at work on a wide range of indexing operations.

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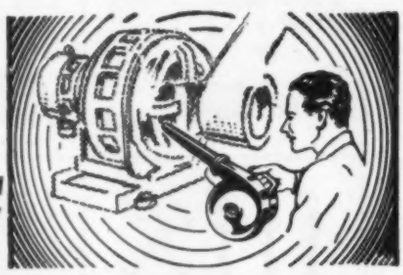
HARTFORD 5, CONNECTICUT

BLOW OUT DUST DIRT LINT *from* MOTORS *and* MACHINERY *with*



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BLOWS clean, dry air at 295 m.p.h. Plugs in at any electric outlet. Costs less than 3c an hour to operate. Easily portable. Weighs only 14 lbs. Cuts power cost. Prolongs equipment life.

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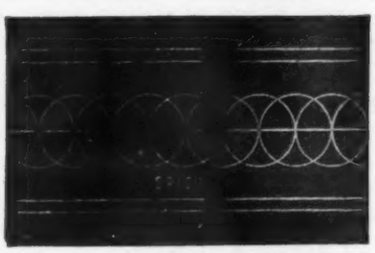
STOPS LOSSES

making dies & templates



simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

THE DYKEM COMPANY, 2301 B N 11th St., St. Louis, Mo.
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YELLOW HEAD GRINDING WHEEL DRESSERS

Self-Lubricating

Faster Dressing without overheating

A *Magazine for dry graphite*
B *Ducts to bearings*
C *Spindle bearings*
D *Safety Head*

For more than 20 years YELLOW HEAD "Self-Lubricating" Dressers have increased cutting speed of grinding wheels while decreasing dresser and cutter maintenance.

When using the YELLOW HEAD a thin film of graphite is sucked from the magazine handle, increasing wear and preventing overheating. Dry graphite guarantees free, greaseless lubrication. Economical, safe. Selection of cutting heads available. "Yellow Head" also co- es in plain type, one piece handle and head.

CITY MACHINE COMPANY, PIQUA, OHIO

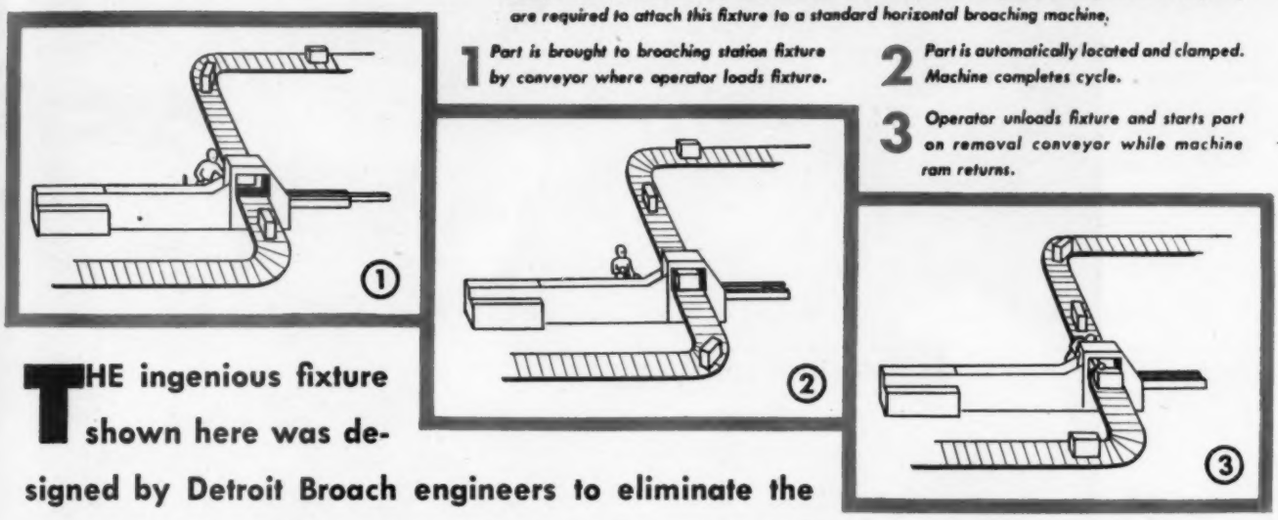
YELLOW HEAD *Write* for complete details, prices

Broaching CRANKCASES and CYLINDER BLOCKS

ON A

Standard Machine

Above is shown the fixture; note the standard face plate. No special arrangements of any kind are required to attach this fixture to a standard horizontal broaching machine.



1 *Part is brought to broaching station fixture by conveyor where operator loads fixture.*

2 *Part is automatically located and clamped. Machine completes cycle.*

3 *Operator unloads fixture and starts part on removal conveyor while machine ram returns.*

THE ingenious fixture shown here was designed by Detroit Broach engineers to eliminate the usual special machine required for broaching cylinder blocks, crankcases and similar very large pieces. The fixture is attached to the end of a standard horizontal broaching machine. Production is very high and loading and unloading are very simple.

This is another instance where wide experience in broaching and imaginative application of proved engineering principles by Detroit Broach engineers has produced a tooling that facilitates high production at low cost.

Talk over your production plans with a Detroit Broach man. There may be many places in which he can suggest costs, often using existing equipment.

ARMY NAVY
BROACHING TOOL INSTITUTE

DETROIT *Broach* COMPANY

20201 SHERWOOD AVENUE • DETROIT 12, MICHIGAN

9,000

ABOVE at top is a view in the ACF Brill Motors Company plant showing Federal Welders in production. 54" Federal is in the rear . . . Closeup shows a full extra-length aluminum door being completely welded in the new Federal 84" Spot Welder.

THE Federal MACHINE

Aluminum Spot Welds Per Coach Prove Value of Federal Welders...

The generous capacity, passenger comfort and strength built into modern aluminum coaches by the ACF Brill Motors Company of Philadelphia call for the ultimate in aluminum fabrication. Naturally, resistance welding is specified for a large share of the work.

9,000 aluminum spot welds are required to make a single body. They must be absolutely failure-proof, and, as assembly components are large and costly; the quality of each individual weld must be certain. The newest of the many Federal Resistance Welders installed in the Brill plant is a three-phase condenser discharge stored energy spot welder, with 84" Throat Depth . . . the largest of its kind ever made. It was installed because of the results achieved with a previous 54" Federal, which it now supplements in daily production.

Full extra length doors, full side and end panels, as well as a great many smaller pieces are handled on the big machine. Federal Engineers developed a design so rigid that despite its "reach" deflection is less than on smaller welders. The special requirements of aluminum welding, exactitude of pressure and fast positive follow-up, are achieved so well that rejections are held to a minimum. This is typical of fabrication with Federal Resistance Welders, whether it be spot, projection, flash, butt, seam or "gun" welding. In every branch of the modern metal working field, this sort of efficient production of quality goods is proving that . . . in resistance welding, the name of authority is

Federal

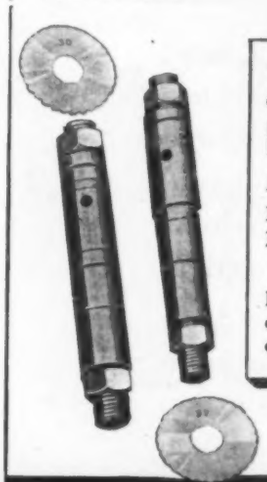
AND WELDER COMPANY

230 DANA STREET • WARREN, OHIO

Much depends on how they're held!

GENTLY, BUT FIRMLY —THAT'S THE RULE

In the tool room this same rule applies. Hobs and cutters must be accurately ground, but the finished grinding will be no more accurate than the accuracy with which they are held.



Knock-Out Cutter and Hob Grinding Arbors are accurate, permit faster set-ups, and save both time and money.

K-O Arbors come in Five sizes:

No. B649..¾" No. B651..1"
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No. B653 . . . . . 1½"

Index Discs with any number of divisions will be furnished on request.

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Gentlemen:
Please send me further information on your Hob and Cutter Grinder Arbors.

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Street_____
City_____
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K. O. LEE
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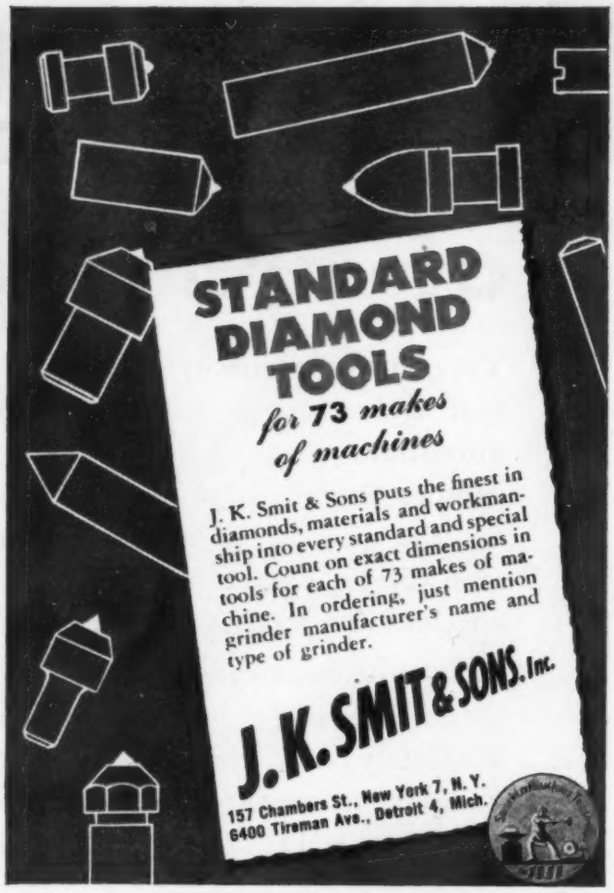

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for 73 makes of machines

J. K. Smit & Sons puts the finest in diamonds, materials and workmanship into every standard and special tool. Count on exact dimensions in tools for each of 73 makes of machine. In ordering, just mention grinder manufacturer's name and type of grinder.

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ALMOND THREE-JAW DRILL CHUCKS—the first to be placed on the market more than seventy years ago—pioneered the field of drill chucks. During all these many years, ALMOND CHUCKS have continued to be a necessary part in the logical procedure of machine developments.

Made in types and sizes to fit all machine tools and portable drills.

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The Original Manufacturers of Drill Chucks

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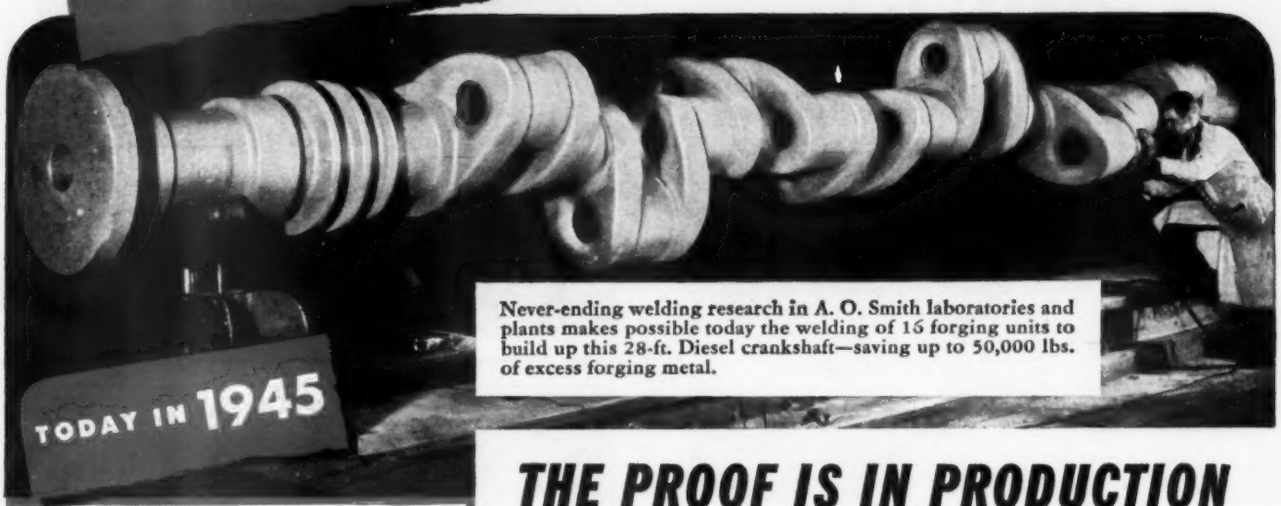
Ashburnham, Mass., U.S.A.

RESEARCH BEHIND THIS 1918 AXLE HOUSING . . . . → MAKES THIS CRANKSHAFT POSSIBLE TODAY ↓

Weld tensile strengths of 50,000 to 60,000 p.s.i. achieved with SMITHway-developed, paper-coated electrodes made it possible, in 1918, to weld longitudinally automotive rear-axle housings—a tremendous step forward in the relatively primitive art of welding.



Never-ending welding research in A. O. Smith laboratories and plants makes possible today the welding of 16 forging units to build up this 28-ft. Diesel crankshaft—saving up to 50,000 lbs. of excess forging metal.

THE PROOF IS IN PRODUCTION

Prior to World War I, welding electrodes were imported from England. When war brought shipping restrictions, A. O. Smith chemists and metallurgists developed a new and radically improved type of shielded arc electrode. They coated the bare wire with paper . . . produced welds of high ductility with tensile strength equal to that of rolled steel plate.

The SMITHway welding research and development that began in 1917 have never ended. They continue today in A. O. Smith laboratories . . . and in A. O. Smith plants, where more than 320,000 SMITHway Electrodes are used in actual production every day. Millions more are used by other manufacturers.

For detailed specifications on SMITHway Certified Electrodes and their application to specific welding jobs, send for the SMITHway Welding Catalog.

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Mild Steel . . . High Tensile . . . Stainless Steel
made by welders . . . for welders

Now . . . a Complete Line of
SMITHway A. C. Welders

The expanded line of SMITHway A.C. Welders includes three new models of 150-, 200-, and 250-ampere capacity, in addition to the Heavy-Duty Models of 300-, 400-, and 500-ampere capacity. Write for complete specifications and prices.

SMITHway Certified WELDING ELECTRODES

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RUST REMOVED QUICKLY

. . . from Ferrous parts before Finishing or Assembling

Parts often rust because they are either held up between machining operations or delayed while waiting for finishing or assembling. When this happens, apply Oakite Compound No. 32 as directed. You'll find it removes rust quickly, easily.

An inhibited acid-type material, Oakite Compound No. 32 is far safer to use than raw commercial acids. More economical and easier to handle, too! For removing oxides, oil or grease from non-ferrous metals, other Oakite acid and alkaline type materials are available.

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FAST · ACCURATE
LOW COST
Graduating

MARKS FIGURES IN SAME OPERATION

Noblewest make both the machines and the dies for precision graduating on round or flat surfaces. Hand or power operated, they save you time and costs as both the graduations and figures are rolled permanently into the piece in one operation. Tell us your graduating requirements and we'll submit our recommendations and prices. Noble & Westbrook Manufacturing Co., East Hartford 8, Conn.

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Precision Graduating Machines

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There is a Grobet Rotary File, Cutter, Diesinkers Bur in shape, size, and coarseness of cut for every type of hard or soft metal, plastic, wood, etc. Send for Catalog DR. Illustrating the complete line in full size, speed charts, etc.

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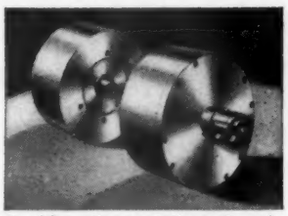
The modern method for modern machines

SERIES 1300-A

Self-centering power chuck with three non-adjusting jaws and forged steel body.



Double-acting, rotating air cylinder for fast operation of power chucks and special headstock fixtures, Series 2100.

Power chucking stands ready to make tremendous savings in time and labor on postwar production . . . where costs will again spell the difference between success and failure.

Skinner stands ready to help with a complete line of self-centering and combination power chucks, air cylinders, operating valves, gages, filters, etc. Skinner power chucks are designed to grip fast, hold tight, and release fast—they cut down on chucking time that otherwise would be an appreciable part of the total time to produce one piece. They are built to Skinner standards of quality workmanship—they are built to last even under severe, constant use.

Write for Catalog which gives complete details on all Skinner products.

Skinner also supplies a complete line of power chucking accessories, such as air valves, pressure regulating valves, pressure gages, lubricators and air filters.

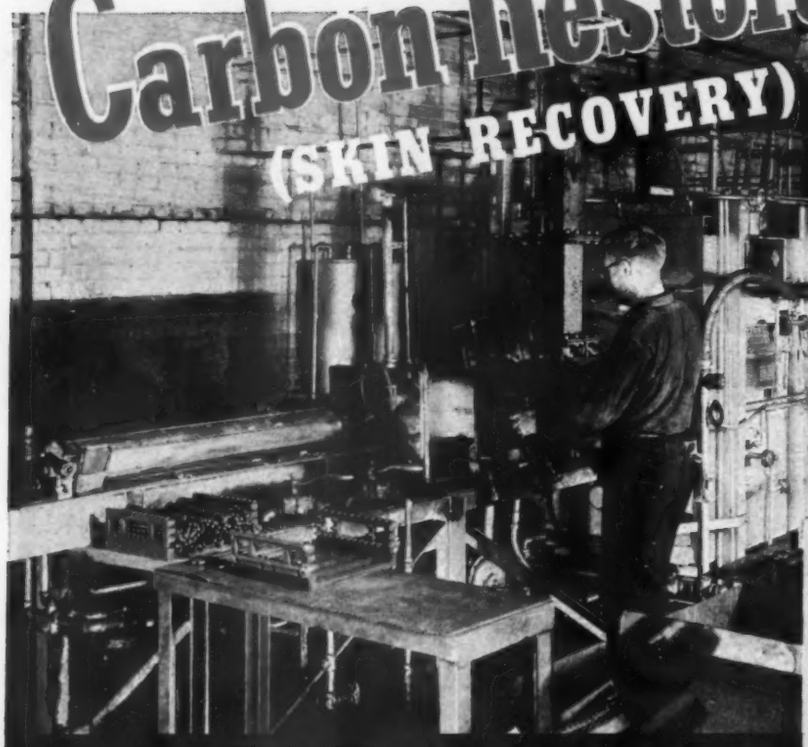
CONSULT YOUR SKINNER DEALER

He is near you—he is ready, willing and able to help you on any standard or special chucking problem you may have.

THE SKINNER CHUCK COMPANY SKINNER CHUCKS **343 CHURCH ST., NEW BRITAIN, CONN.**

HAND & POWER OPERATED MACHINE CHUCKS—AIR CHUCK EQUIPMENT—FACE PLATE JAWS—MACHINE VISES

Carbon Restoration (SKIN RECOVERY)



OF DECARBURIZED STEEL SURFACES

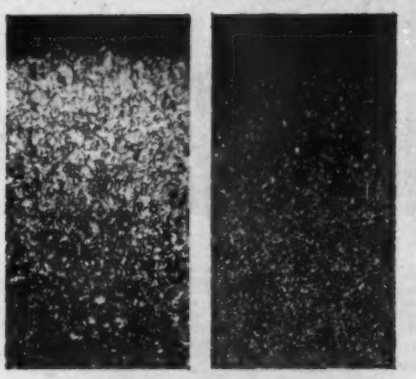
'SURFACE' ACHIEVEMENTS IN THE SCIENCE OF GAS CHEMISTRY AND HEAT TREATING

*

Photo above shows 'Surface' continuous, pusher-type furnace used for carbon "skin recovery" treatment.

● Carbon Restoration or "Skin Recovery" is a simple controlled-atmosphere process based on the principle of carbon pressure balance...applied today to various engineering steels.

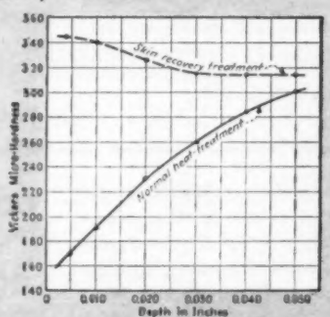
This process is another 'Surface' development to come from extensive research in the Science of Gas Chemistry. Write for reprint "Skin Recovery for Decarburized Steel Surfaces" for further details of the process and application.



ONE EXAMPLE

Left: An SAE 4140 forging showing decarburized edge after normal heat treatment.

Right: Same SAE 4140 forging after "Skin Recovery" treatment.



Hardness vs. depth readings on SAE 4140 steel forgings before and after "Skin Recovery".

'Surface'

***SPECIAL ATMOSPHERE, RADIANT-TUBE FURNACES FOR:** Gas Carburizing and Carbon Restoration (Skin Recovery), Clean and Bright Atmosphere Hardening, Bright Gas-Normalizing and Annealing, Dry (Gas) Cyaniding, Bright Super-Fast Gas Quenching, Atmosphere Malleableizing, Atmosphere Forging, and Specific Effects upon Metal Surfaces.

SURFACE COMBUSTION CORPORATION · TOLEDO 1, OHIO

No More "Hatchet-and-Saw" Workbenches

GET 'EM READY MADE FROM HALLOWELL

Fig. 732 Pat'd Pats. Pend. Drawer is extra.

Fig. 1740 Foreman's workshop Pat'd and Pats. Pend.

Why bother with unsatisfactory, bulky "hatchet-and-saw" workbenches of wood, when it's *so easy* to get just what you want in "Hallowell" benches of Steel. The famous "Hallowell" line offers you workbenches of Steel in over 1300 ready-made combinations . . . sturdily built to withstand long, hard wear. The "Hallowell" benches of Steel can be easily dismantled and reassembled if need be. Try to do this with wooden benches and all that's left is a pile of kindling. And "Hallowell" is the exclusive line that brings you benches in 5 different leg heights, 7 standard lengths. "Hallowell" equipment comprises a variety of other shop and plant necessities, too. *Write today for our FREE "Hallowell" Catalog.*

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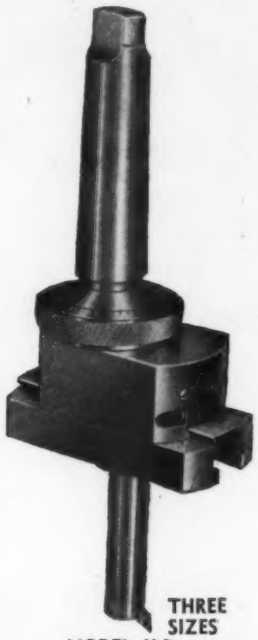

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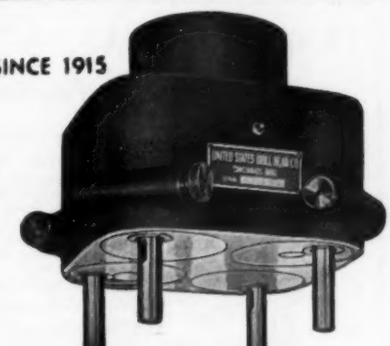

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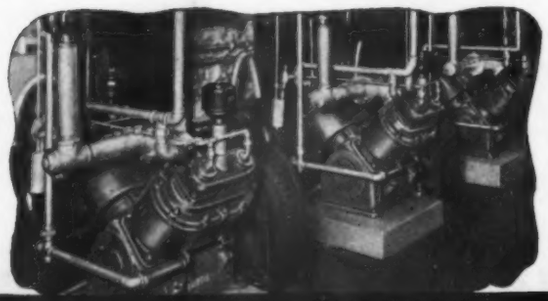

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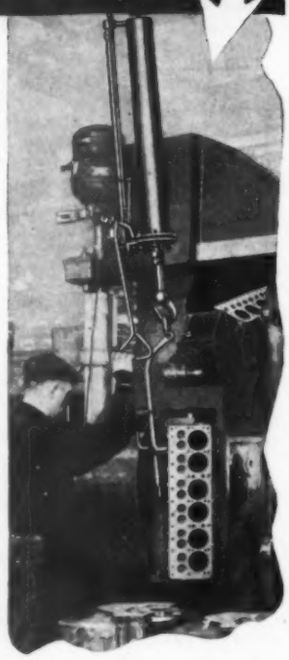

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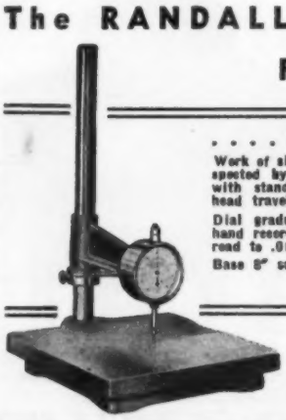

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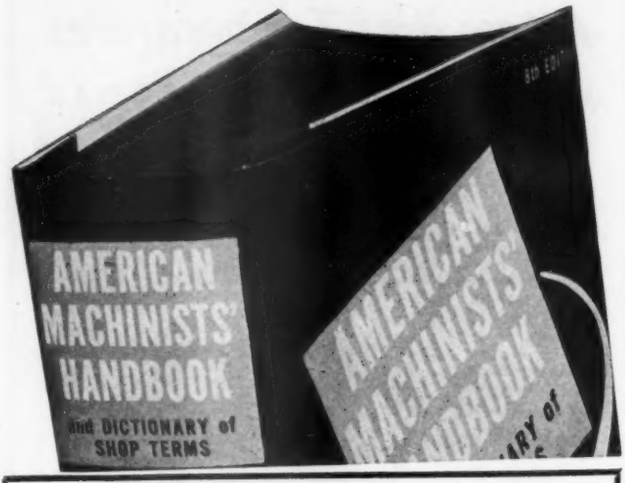

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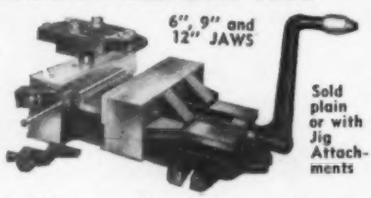

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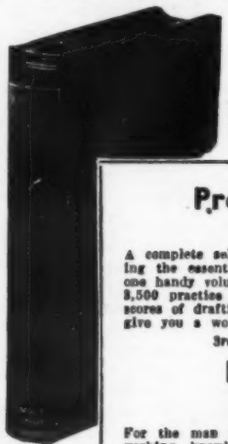

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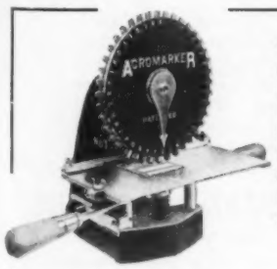

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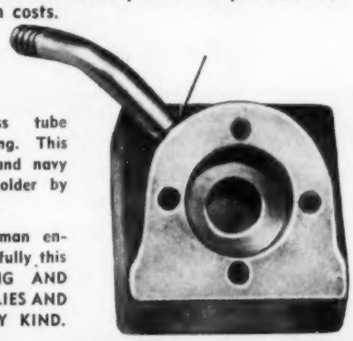

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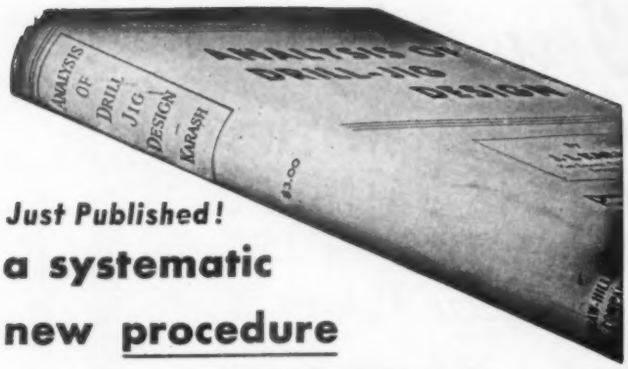

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—meet shop and production requirements most completely

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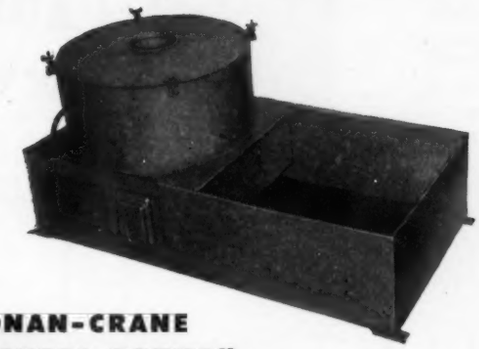

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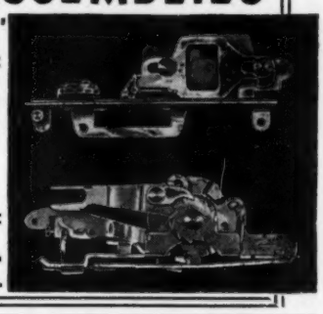

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Additional Contract Work Advertisement on page 343

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The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

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NEW ADVERTISEMENTS received by 10 A.M. March 13th will appear in the issue of March 28th subject to limitations of space available

WANTED — PLANT SUPERINTENDENT

Capable of taking full charge of medium-sized machine tool rebuilding factory. Thorough knowledge of all types of metal-working machinery absolutely essential. Must know rebuilding business throughout. Highest quality work necessary. Experienced in engineering, designing, tooling, processing and assembly. Must be entirely familiar with factory operations. Knowledge of estimating, scheduling and costs important. Able to handle 75-100 men and labor relations under union contract. Location eastern Mass. Good salary, excellent opportunity and permanent position for right man. Must be industrious, conscientious and thoroughly experienced. All replies confidential. *Write, giving full particulars regarding positions held, education, complete personal data and references.*

P-615, AMERICAN MACHINIST
330 West 42nd Street
New York 18, N. Y.

WANTED

MECHANICAL ENGINEER

Must be thoroughly experienced in all gear manufacturing problems as well as designing; only those with extensive gear experience need apply. Exceptional opportunity. Write full history including name of university and year graduated; names and addresses of all former employers; age; salary desired.

P-581, American Machinist
330 W. 42nd St., New York 18, N. Y.

SELLING OPPORTUNITY OFFERED

REAMERS AND milling cutters forged to larger sizes. Life of tool increased 3 to 6 times. Saving 25%. Fully guaranteed. Sales representatives wanted in Cincinnati, Chicago, and Milwaukee. Commission basis. Write Box L, Spring Lake, Michigan.

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SALARIED POSITIONS $2,500-$25,000. This thoroughly organized confidential service of thirty-six years' recognized standing and reputation carries on preliminary negotiations for supervisory technical and executive positions of the calibre indicated through a procedure individualized to each client's requirements. Retaining fee protected by refund provision. Identity covered and present position protected. Send only name and address for details. R. W. Bixby, Inc., 266 Dun Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

MACHINE SHOP superintendent experienced in job shop machine tools, jigs, dies and fixtures, 15 years as mechanical supervisor of maintenance and mechanical shops. Best of reference and record furnished. PW-604, American Machinst, 330 W. 42nd St., N. Y. 18, N.Y.

TOOL ROOM Superintendent: age 36, highly experienced in tool and die design, especially high-production progressive dies, small lot production, all machine tools and the tooling for these machines, methods and motion study, is seeking employment with a progressive firm. PW-605, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

MECHANICAL ENGINEER: Veteran Naval officer, B.S. in M.E. in 1939. 1½ years operation and maintenance in power plant, 2 years supervising installation of machinery in Government Powder plants. Experienced in operation of machine tools, welding and wood-working machinery. Desire an engineering position with a future. A. H. Eikelberger, Orofino, Idaho.

TOP GRADE, aggressive sales engineer, deferred throughout World War II because of indispensability to industry, now desires change in connections for a more progressive firm and greater security. Possesses executive and sales ability, ingenuity and broad mechanical engineering background. Graduate of M.I.T. 1937. Experienced in sales promotion and dealer education. Thoroughly capable as factory representative. Six years in field for present company selling special purpose machinery to diversified manufacturing industries. Thoroughly familiar with manufacturing processes, machine design, tool and fixture design, and supervision of machinery installation and maintenance. Easily adaptable to any field of manufacture. Organization offering position should be high grade and progressive in product and management. PW-618, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

RESPONSIBLE MECHANICAL Engineer, many years with machine tool manufacturer, now desires new connection with a more progressive organization. Experienced in product processing, cost estimating, and machine, tool, and fixture designing. Thoroughly familiar with production methods, machine tools, as well as installation and maintenance of machinery. Has pleasing personality and ability to get along with men, inventive as well as executive ability and wide technical knowledge. M.I.T. graduate. Position offered should have good future prospects leading preferably to master mechanic or plant engineer. PW-619, American Machinist, 520 No. Michigan Ave., Chicago 11, Ill.

(Continued on opposite page)

WANTED

MECHANICAL ENGINEER

Must have intensive experience in the designing and production of screw pumps. Write names and addresses of all former employers; age; salary desired.

P-611, American Machinist
330 W. 42nd St., New York 18, N. Y.

WANTED
SHOP SUPERINTENDENT

Practical machine shop experience as a machine operator, experienced tool layout and set up. Knowledge of modern shop control. Supervision and direction of men. Location, New York City.

P-600, AMERICAN MACHINIST
330 West 42nd Street, New York 18, N. Y.

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Additional Positions Vacant Ads on opposite page

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Must be capable of estimating, planning and routing variety of precision machinery parts for economical production in small and medium lots; also design all special tools needed such as drill jigs, fixtures and form tools.

Background should include minimum of ten years experience as machinist and toolmaker supplemented by considerable technical knowledge.

Will have full responsibility of entire department with supervision of 30 to 50 men operating turret lathes, engine lathes, milling machines, grinders, drill presses, planers, shapers, etc.

Attractive proposition for the man who can fill this job with progressive company in Virginia. Reply

P-608, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

EXECUTIVE ENGINEER

To Assist President

Prominent, AAA1 midwest manufacturer of industrial equipment is seeking an engineer of executive calibre to act as liaison officer to assist the President in the planning, direction and follow-up of all engineering activities.

The man we want should be a graduate engineer between 40 and 45; he should have broad experience in metal working and knowledge of methods of preparing metal surfaces for various finishes; he should have the initiative, motive power, and "know-how" to pursue an idea from an engineer's conception through the stages of research, experimental work, design, and well organized manufacturing and sales methods to commercial practice; he should be a tactful organization man accustomed to working with others and sparking their efforts.

During the 38 years of our existence we have become the leader in our field. Constant technical research is the backbone of our business. It is responsible for the development of processes and equipment that are continually expanding our markets.

If you feel qualified for the position referred to, please write us fully, enclosing a snapshot if possible. Your letter will be held in strict confidence. Address

P-612, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED

Experience design engineer for immediate and permanent employment. By a progressive manufacturer of precision machine tools for rebuilding internal combustion motors, primarily automotive. A pioneer in the field with world wide distribution for over 25 years and located in medium sized mid-west city. If you would like to affiliate with a well-established company that is small enough so that individual merit is bound to receive just recognition, write giving complete personnel history, enclosing recent photograph. All replies confidential.

P-556, AMERICAN MACHINIST
330 WEST 42nd ST., NEW YORK 18, N. Y.

WANTED

SALES ENGINEERS

To represent a modern gear manufacturing plant. Must have a degree in mechanical engineering as well as extensive selling experience in the gear industry. Write full details including name of university and year graduated; names and addresses of former employers; salary and territory desired and other pertinent details.

SW-609, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED

TOOL ENGINEER

Must have M.E. degree, plus extensive experience in tool and die design, preferably relating to metal fabrication and forging work. Should have good knowledge of methods, process, time study and standard cost procedure. Must be interested in settling in small midwestern town in a medium-sized but highly progressive company. Please give full information covering experience, references, and salary expected. Address

P-610, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

WANTED

Experienced Physical Tester. Should have experience in physical testing of metals, textiles, or paper. Man with college degree preferred. This is a permanent position with excellent opportunities. For application, address Manager, Technical Employment, 306 Fourth Avenue, Pittsburgh, Pennsylvania.

WESTINGHOUSE ELECTRIC CORPORATION

WANTED

Foreman for small Machine Shop located in Northwestern Pennsylvania. Must have Machine Tool experience. Write giving age, experience, starting salary expected and when available.

P-527, AMERICAN MACHINIST
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POSITIONS WANTED
(Continued from opposite page)

COST ESTIMATOR: technical education, 14 years experience in time study, production planning, cost and methods analysis and estimating in all phases of machining, flat metal fabrication, assembly and tooling with a thorough knowledge of all types of machinery. Present employment—chief cost estimator. Interested in permanent position with future. Will go anywhere. PW-617, American Machinist, 330 W. 42nd St., New York 18, N. Y.

INDUSTRIAL MECHANICAL Engineer—qualified and experienced in the fields of production control, manufacturing and engineering liaison. Excellent record in developing efficient organizations. Have the capacity to get things done. Six years at present position in the precision manufacturing business. PW-620, American Machinist, 330 West 42nd St., New York 18, N.Y.

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LATIN AMERICAN Representation. American college graduate, M.E. degree, native of Cuba, knows Latin America thoroughly, will represent manufacturers of machinery, mechanical devices, engineering equipment in any Latin American territory. Now in U.S.A. willing to undergo training period to learn technical detail. RA-606, American Machinist, 330 W. 42nd St., New York 18, N. Y.

TOOL ENGINEER: desires exclusive representation of carbide tools, gages, and milling cutter lines in North Western Pennsylvania area. Past sales records available. Excellent background and the best of reference. RA-621, American Machinist, 330 West 42nd Street, New York 18, N. Y.

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Resident of this area for past 25 years with wide acquaintance and sales experience invites correspondence with manufacturers of basic products salable to automotive trade.

RA-614, AMERICAN MACHINIST
520 North Michigan Ave. Chicago 11, Ill.

CONTRACT WORK

(Continued from page 341)

BULLARD MULT-AU-MATIC CHUCKING WORK

Any material, up to 14" diameter. Large quantities required. Send blueprints or samples for estimate.

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BROOKLYN 13, N. Y.

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700—#1B—7" EDLUND BALL BEARING SINGLE SPINDLE HIGH SPEED DRILL PRESSES—#1 M.T. cap. ½" in steel—motor drive and ⅜" drill chucks
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70—#416E PEXTO HAND SLIP ROLL FORMERS—3"x36" rolls—14-16 ga. cap. floor type
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50—#03 BELOIT BENCH TYPE SLITTING SHEARS—cap. ⅛"—5" blade

WOODWORKING MACHINES

20—J70—12"x5' YATES AMERICAN WOOD TURNING LATHES,—motor drive
50—#303 WYSONG & MILES DISC & SPINDLE SANDERS—26" disc—motor drive
15—#173 OLIVER SCROLL & JIG SAWS—36" throat—tilting table—motor drive

Free Illustrated Descriptive Circular on request—send for your copy. All sales will be final. No red tape.

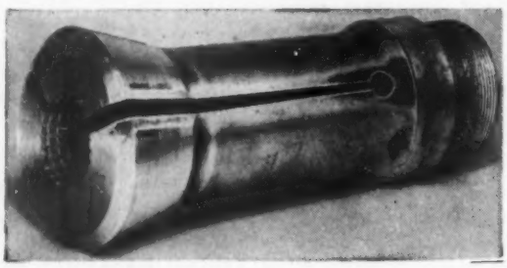
Inspection—From noon of April 1st to sale date. Everything will be sold piece by piece in single lots.

SALE UNDER MANAGEMENT OF

INDUSTRIAL PLANTS CORPORATION

PROFESSIONAL AUCTIONEERS LIQUIDATORS APPRAISERS
316 S. LaSALLE ST. CHICAGO 4, ILL.
90 W. BROADWAY, NEW YORK 7, N. Y.
Toledo, Ohio • Pittsburgh, Pa.

Large Stock of NEW Collets



Also—Feed Fingers—Pads—Threading Equipment & Parts—Double Deck Tool Holders—Cams—Die Heads—Roller Bearings and All Other Attachments.
For R. A. 6 Gridley Automatics 1"—1¼'—1⅜"—1⅝"—2⅝".

NEW Collets — Parts and Cams for
1" and 1⅝" New Britain.

We have a large stock of used collets and parts for Acme, Acme Gridley, Cleveland, Cene, Foster, No. 4 and No. 6 Warner & Swasey, Bardons & Oliver, Brown & Sharpe, Davenport, Garvin and New Britains.

GRAFF MACHINE TOOL COMPANY
7139 So. Halsted Street *Vincennes 9664* Chicago 21, Ill.

WANTED

WANTED
Ingersoll Planer type Miller, 36"x36"x12' 4 Heads, Motor Drive. Must be 1942 or later model. Please give us description in full including condition, location, equipment and lowest individual price for resale.
D. BEAL MACHINERY CO.
261 Franklin St. Boston, Mass.

WANTED
Medium size used milling machine, universal 3A or 2A Brown and Sharpe or equivalent, motor driven, 220 volts, 3 phase, 60 cycles with vertical milling attachment and dividing head. O.K. if in need of minor repairs.
THE PUEBLO MACHINE SHOP
Santa Fe and 10th St. Pueblo, Colorado

THREAD GAGES—PLUG AND RING

Slightly used, NF-2, 3¼ to 1", 6, 8, 10 M.S. Also 1 to 4" N.S.
Less 75 Percent Discount

ADJUSTABLE SNAP GAGES. ALL SIZES. ½ to 8".
LESS 75 Percent Discount.

DE WITT TOOL COMPANY
173 GRAND STREET NEW YORK 13, N. Y.

NEW "SEARCHLIGHT" ADVERTISEMENTS

received by March 13th, will appear in the March 28th issue, subject to limitations of space available.

Address copy to the Departmental Staff

AMERICAN MACHINIST
330 West 42d St., New York City

Additional Auction Advertisement on page 348

EVERY ITEM GUARANTEED AS REPRESENTED

FALK FOR DEPENDABILITY IN REBUILT MACHINERY

AUTOMATICS

6—#61 New Britain-Gridley 6 Spindle 1⅝" cap. Automatic Screw Machines. A.C. Motor Drive, Threading Spindle.
1—1¼" Cone 4-spindle Automatic, Motor Driven, Threading Spindle.
1—#515 National Acme 1⅝" 4-spindle Automatics, complete
2—#55 National Acme 1⅝" 4-spindle Automatics, complete
1—#2G Brown & Sharpe Automatic.
1—#1 Brown & Sharpe Automatic, old style.

BORING MILLS

100" Niles-Bement-Pond Bor. & Turn. Mill.
3½" Bar Landis-Rochester Horizontal Boring Mill, Model #36.
#31 Lucas Horizontal Boring Mill, 3" bar.
72" Cincinnati Heavy Pattern Vertical Boring and Turning Mill.

DRILLING MACHINES

Avey, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle, #2 M. T.
Fosdick 13" Super speed 4-spindle drills.
Natco #12, 12 spindle #1 M. T.
Natco #14, 22 spindle Rectangular head Drilling Machine.

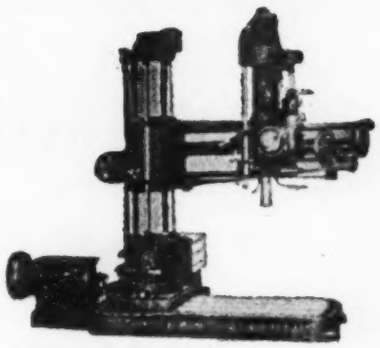
RADIAL DRILLS

3' 9" column Cincinnati-Bickford.
3' 9" col. American, S.P.D.
3' Dreses, 10" col. QCG., M.D.
3' 10" Col. Fosdick
5' Arm 13" Column Cincinnati-Bickford.

GRINDERS

12" No. 22 Heald Rotary Surface Grinder.
16" Persons-Arter Rotary Surface Grinder.
#4 Brown & Sharpe Universal Grinder.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump. 15" swing, 5" hole, 4" dee.
Oliver Model 51 Drill Grinder; 1½" cap.

Blanchard Grinder #16, 30" dia. magnetic Chuck, 25 HP 3-60-440 V. Motor.
2—#2 Cincinnati Centerless Grinder.
Pratt & Whitney Vertical Surface Grinder, 14"x36" with 10"x36" Magnetic Chuck. Ball Bearing Spindle. Perfect Condition.
#2 Cincinnati Universal Tool and Cutter



Cincinnati-Bickford 5' Arm, 13" round column with air clamp. Oil grooved, tee slotted base, side base, with plain box table with #5 Morse Taper spindle. Motor drive.

#2 Brown & Sharpe Surface Grinder.
#70 Heald Internal Grinder.
#60 Heald Cylinder Grinder.
#11 Brown & Sharpe Plain Cylindrical.
10" x 18" Norton Cylindrical.

LATHES

14" x 6' Hendey Toolroom Lathe, geared head.
14" x 8' Hendey Toolroom Lathe, motor drive.
14" x 8' LeBlond Toolroom Lathe, cone drive.
14" x 12' Hendey Toolmakers Lathe, motor drive.
16" x 6' Rockford Toolroom Lathe.
16" x 6' American Motor Driven Lathe.
16" x 8' American Motor Driven Lathe, taper.
27" x 18' Lodge & Shipley Geared Head Lathe.
26" x 12' Putnam Quick Change Gear Lathe.
18" x 6' American 12-speed geared head, M.D.
20" x 8' American 12-speed geared head, M.D.

TURRET LATHES

16" Warner & Swasey Brass Lathe.
#2A Warner & Swasey Universal
#4 Warner & Swasey Universal
#4 Foster Turret Lathe.
#6A Potter & Johnson Automatic Chuckers.
#3R Gisholt Universal like new.

MILLING MACHINES

#3, #4, #5 Cinn. High Power, Plain, S.P.D.
No. 0 Bickett Vertical Bench Miller.
#1-#1½-#2 Brown & Sharpe Plain Miller.
P & W 2½" Duplex Spline Miller.
Hall Planetary Thread Miller 24".
#8 Lees Bradner Thread Miller.
#1, #2 Kempsmith Plain Millers.
#2½, #3 LeBlond Universal.
3B Hendey Universal Miller, single pulley drive.

PLANERS

30"x30"x10' Cinn. Heavy Pattern, 2 Hds.
20"x20"x24" N.-B.-P., Planer Shaper, M.D.

POWER PRESS HEADQUARTERS

#4 Bliss D. C. Forging Press.
200 ton A.C.F. Hydraulic Press. Bed 24" x 36", 4-post.
3—25 ton K. R. Wilson Hydraulic Presses.
Beck Duplex Embossing Press.
75 ton H.P.M. 2 post, Hydraulic Press.
#1 Bliss Straight Side, double action, Cam Press. Plain flywheel drive, double roll feed.
#22C Ferracute Plain, motor drive.

SHAPERS AND GEAR CUTTERS

12" Schuchart & Schutte Gear Hobber.
#1 Adams Gear Hobbers, Belt driven (3).
16" Gould and Eberhardt
21" Smith & Mills B.G. Helical Gears.
24" Gould & Eberhardt Shaper.
20" Queen City Brand New.

SHEARS & METAL CUTTING MACHINERY

Lennox Splitting Shear, ¾" cap.; 8' throat.
Lennox Bevel Shear, ¾" cap.
Gould & Eberhardt Slitting Shear, 10 ga.
Bertsch 3"x36" Geared Slip Roll Former.
Niagara 48" Roller Leveller, 6 Rolls.
12' x 12 Gage Loy and Nawrath Geared Underdriven Power Squaring Shear.

MISCELLANEOUS

Waterbury-Farrel Cold Header, double stroke, open die, ½" x 6".
Manville Cold Header, single stroke, solid die, 3/16" cap.
Manville #3 Thread Roller, belt dr.

Thomson Cutter and Creaser, 12½x18½.
Heat Treating Furnaces for the tool room.
Hydraulic Pumps—Hele Shaw, Racine, Oil Gear, Motor Driven.
Blake and Knowles 12x2x12 Simplex Type, Hydraulic Steam Pump, 2000 lbs. pressure with 80 to 125 lbs. steam, delivers 9 gallons per minute.
No. 7B High Speed Riveting Hammer, cap. ¾" to 1½. New this year.
#5A High Speed Riveting Hammer.

BUY FROM STOCK
Telephone
MAIN 6347-6348

FALK
MACHINERY COMPANY
Machinery Merchants

18 WARD ST.
ROCHESTER 5
N. Y.

MOREY DEPENDABLE

MOREY:

. . . established over 30 years

. . . 140,000 sq. ft. of warehouse space

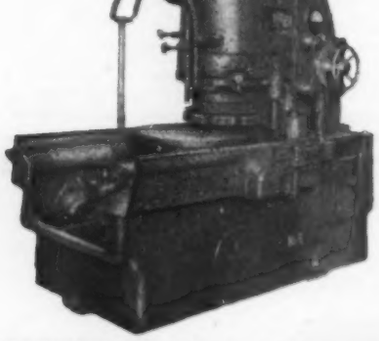
. . . stock of over 1500 tools

. . . precision rebuilding

AVAILABLE for PROMPT SHIPMENT

GRINDERS

HEALD #70 Internal
BROWN & SHARPE #5 Pl. Cyl. 3x18; latest type
LANDIS 4x12 Type H Pl. Cyl. Hydraulic; latest type
LANDIS 10x48 Type C Pl. Cyl. Hydraulic; latest type
NORTON 24x240 Pl. Cyl.; motor drive
BROWN & SHARPE #2B Surface; latest type
NORTON 6x18 Surface; latest type
THOMPSON 6x18 Type F Surface; latest type
MATTISON 16x24x96 Surface; latest type



BLANCHARD #18, 30" chuck; latest type

BLANCHARD #16 motor drive; 26" chuck
PRATT & WHITNEY 14x60 Sur. Hydraulic; latest type
ARTER 8" Rotary Surface
ARTER Automatic Piston Ring
BROWN & SHARPE #1, #2, #3 Univ.; latest type
LEBLOND #2 Univ. Tool & Cutter; latest type
BROWN & SHARPE #13 Univ. & Tool; latest type
PRATT & WHITNEY Contour Cutter Grinder; latest type
UNIVERSAL Spline Shaft; Hydraulic

BORING MILLS—Horizontal

LUCAS #32, 3¾" Bar; Latest Type
LUCAS #41, 3" bar; latest type
LUCAS #42, 4" bar; latest type
GIDDINGS & LEWIS #0, 3⅛" bar
NILES BEMENT POND, 5' Bar
NILES BEMENT POND, 7" Bar

BORING MILLS—Vertical

BULLARD 24", 36", 42" New Era Type
BULLARD 54" Spiral Drive; latest type
KING 72", 2 swivel heads; motor drive
NILES BEMENT POND 84", 2 Swivel heads; Motor Drive
NILES BEMENT POND 120", 2 Swivel heads; Motor Drive

DRILLS

AVEY #1, 3 spindles
AVEY #2, 1 to 6 spindles
LELAND & GIFFORD #1, 1 & 2 spindles
COLBURN #D3; capacity 3"
NATCO #12 multiple spindle
NATCO C-13H multiple spindle
PRATT & WHITNEY #1/2B x 30"; #1/2B x 50", 2 spindle Deep Hole
CINCINNATI BICKFORD 3'9" Radial; latest type
AMERICAN 5'11" Radial; latest type

GEAR CUTTING EQUIPMENT

FELLOWS #712 Gear Shaper
GLEASON 3", 6", 11", 18" Bevel Gear Generators
GLEASON 12" Bevel Gear Generator; late type
GLEASON 10", 15" Spiral Bevel Finisher
GLEASON Bevel Gear Tester
BROWN & SHARPE #13 Gear Cutter
BROWN & SHARPE #6 x 60 Gear Cutter
GOULD & EBERHARDT 3 spindle Gear Cutter
BARBER COLMAN #3 Gear Hobber
GOULD & EBERHARDT #96H Gear Hobber
CINCINNATI Gear Burnisher

PLANERS

CINCINNATI 24" Crank
LYND FARQUHAR 26" Open side
CINCINNATI 30x30x10' Box Table, PRT, 2 hds.
CINCINNATI 36x30x5' Box Table, Prt, 1 hd.
CINCINNATI 36x36x12' Box Table, PRT, 4 hds.
HAMILTON 42x42x20', 4 heads
GRAY 48x48x16', 4 heads
CLEVELAND 48x48x16' Open Side, 3 hds.
DIETRICH & HARVEY 48x48x16', 4 hds, Hydraulic
GRAY 72x48x12', 2 heads
NILES BEMENT POND 96x80x20', Box Table, 4 hds, Hydraulic, PRT
CINCINNATI 120x96x20', 4 hds, box table, PRT

YOUR INQUIRIES ARE INVITED . . .

MOREY MACHINERY

USED MACHINE TOOLS

MILLING MACHINES

BROWN & SHARPE #2A Univ., Timken Bearing, latest type
VAN NORMAN #26, #36 Univ., Timken Bearing, latest type
BROWN & SHARPE #2B Pl., standard type, Timken Bearing
KEARNEY & TRECKER #2H, #2K Plain, Timken Bearing
CINCINNATI #3DT Ver., Timken Bearing
GORTON #8D Ver., high speed, latest type
GORTON #8½D Vert. high speed latest type
KEARNEY & TRECKER #3K, #4K Ver., Timken Bearing
BROWN & SHARPE #10, #12 Auto., Timken Bearing
KEARNEY & TRECKER #1218 Auto., Timken Bearing
CINCINNATI 45x48 Hydramatic, Timken Bearing
INGERSOLL 42x36x16' Planer type, 4 heads
MOREY #12M 2-spindle Milling & Profiler

JIG BORERS

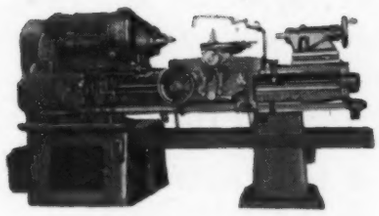
CINCINNATI BICKFORD 28", latest type
LINLEY High speed, latest type

THREAD MILLING MACHINES

PRATT & WHITNEY 4½x12, 6x20 Model C, latest type
LEES BRADNER Model LT 6x36, latest type
PRATT & WHITNEY 6x120, 6x132, motor drive
MOREY SHIELDS 12x30, 12x60, 12x120, 12x192, latest type

SHAPERS

PRATT & WHITNEY 6" Vertical
MOREY 10" Vertical, latest type
PRATT & WHITNEY 10" Vertical
MOREY 14" Vertical, latest type
MORTON 30" Draw Cut
DILL 18" Vertical Slotter



LODGE & SHIPLEY 14x30 centers, Timken Bearing, latest type

LATHES

MONARCH 10x20 centers Model EE, Timken bearing, latest type
MONARCH 14x30 centers Timken Bearing, latest type
MONARCH 14x54 centers Timken bearing, latest type
HENDEY 14x6' bed, geared head, motor drive
HENDEY 16x6' bed. geared head, motor drive
AMERICAN 16x8' bed
LODGE & SHIPLEY 18x8' bed, geared head
LEBLOND 18x54 centers, Timken bearing, latest type
LEBLOND 21x16' bed, geared head
MONARCH 30"x10' bed, Timken Bearing
HENDEY 12x54 centers Mfg. Type
HENDEY 14x42 centers Mfg. Type; latest type
HENDEY #3x54 centers Mfg. Type
LEBLOND 17x6', 9' and 14' bed Timken Bearing, Mfg. Type
AXELSON 20"x120"; latest type
LEBLOND 20"x140"; latest type

LATHES—TURRET

MOREY #2G, 1" cap. Timken Bearing
MOREY #3 Univ., 1½" cap. Timken Bearing
MOREY #4 Univ., 2" cap. Timken Bearing
WARNER & SWASEY #1A Univ. Timken Bearing
WARNER & SWASEY #2A Univ. Timken Bearing
WARNER & SWASEY #3 Univ. 1½" cap. Timken Bearing
BORDONS & OLIVER #3, latest type
GISHOLT #2L Univ. Timken Bearing
POTTER & JOHNSON #6C; motor drive

AUTOMATIC SCREW MACHINES

CLEVELAND ⅞" to 2½" Model A

PRESSES

CLEARING #SO-842 single action, 215 tons, latest type
CLEARING Type K-1200-30 Knuckle Joint, 200 tons, latest type
CLEARING Type F-1100-36 single action, 100 tons, latest type
CLEARING Type 730 single action, 160 tons, latest type

MISCELLANEOUS

CLEVELAND 12x16" Cutter Relieving Machine
COLONIAL Model FS-2-72 Broach
WATSON STILLMAN Hyd. Straightening Press
BILLINS & SPENCER #2 Hot Trimmer
BLOUNT 4"x6' Speed Lathe
SAUNDERS #9, 8 to 18" Pipe Machine

LIQUIDATORS of PRODUCTION PLANTS REBUILDERS of MACHINE TOOLS CONSULT US on your MACHINE TOOL PROBLEMS

PROMPT SERVICE IS ASSURED

CO., INC.

410 BROOME ST., NEW YORK 13, N.Y.
TELEPHONE—CANAL 6-5360
Detroit Representatives: Morey Machinery Co.,
2832 E. Grand Boulevard, Detroit, Mich.

ADVANCE NOTICE

AUCTION! AUCTION!

FORMER ORDNANCE PLATE PLANT
ON THURSDAY, MARCH 28, 1946 at 11 A.M.
***Located at the former* Carnegie-Illinois Steel Company (Farrell Works), Farrell, Pa.**

WRITE, WIRE OR PHONE FOR FULL PARTICULARS

- PLANERS
- RADIAL DRILLS
- PRESS BRAKE
- HYDRAULIC PRESSES
- PLATE WELDERS
- CRANES
- SHOT BLAST UNITS
- GRINDERS
- FURNACES
- FORGING PRESS

Electric shop tractors, Shop trucks, Motors, Cutting equipment, Hardening Furnaces, Transformers, Milling Machine, Saws, Lathes, and other important machinery and equipment.

SAMUEL L. WINTERNITZ & CO.

Auctioneers — Liquidators — Appraisers

38 S. DEARBORN ST. **CHICAGO 3, ILL.**

Phone State 5908

These advertisements

are current, live opportunities in the metal-working field.

Each advertisement represents a current Want or Offering of an organization or individual in this field, with some element of profit in each for whoever can fill the need. Some have money-saving possibilities, others are opportunities for more business; many are employment opportunities; still others offer property, or equipment—used or surplus new equipment.

"Searchlight" advertisements are constantly changing. New opportunities are finding their way into this great Want medium each issue. Regular consultation of the "Searchlight" pages can be as important to you as reading the text pages of each issue; Text matter is news of progress and development in the industry; "Searchlight" advertising is news of current "Opportunities" in this industry.

for EVERY business WANT
"Think SEARCHLIGHT first"

Additional Auction Advertisement on page 344

FOR IMMEDIATE DELIVERY

650 MACHINE TOOLS OF LATEST TYPE AND DESIGN

BUILT AFTER 1941 - - TIMKEN BEARING

LATHES — ENGINE

All Are Geared Head, Motor Driven

SEBASTIAN "H" 16"x8' Bed—Timken Bearing
LEBLOND 16"x54" Centers—Timken Bearing
LODGE & SHIPLEY 16"x54" Centers—Timken Bearing
PRATT & WHITNEY "C" 16"x78" Centers—Timken Bearing
SPRINGFIELD Precision—18"x30" Centers—Timken Bearing
REED PRENTICE 20"x10'—geared head
LEHMAN 24"x18'—geared head
AXELSON 24"x72" Centers, 24 speed—Timken Bearing
AXELSON 24"x120" Centers, 24 speed—Timken Bearing
AMERICAN 27"x96" Timken Bearing
LEBLOND 27"x96" Timken Bearing
AXELSON 32"x120" Centers, 24 speed—Timken Bearing
AMERICAN 36'x15' bed
AMERICAN 36'x22' bed
BRIDGEFORD 36'x32' bed—2 carriages
NILES 36'x25' centers—2 carriages; PRT—Timken Bearing
BRIDGEFORD 42'x35' bed—2 carriages
AMERICAN 42'x40' bed—2 carriages
LEBLOND 48'x22' centers; 48"x34" centers; 48"x40" centers—2 carriages—Timken Bearing—PRT

LATHES — TURRET

BARDONS & OLIVER #5 Univ.; Timken bearing; chucking
BARDONS & OLIVER #7 Univ.; Timken bearing; chucking
WARNER & SWASEY #4A Univ. Hollow Hex.; Timken Bearing
CINCINNATI ACME #1 Universal—Timken Bearing
FOSTER #2F Univ. Fastermatic; Timken Bearing
FOSTER #3F Univ. Fastermatic; Timken Bearing
POTTER & JOHNSTON #5D Power-Flex Auto. Chucking & Turning; Timken Bearing

DRILL PRESSES

FOSDICK #4 BM, 1 spdle; 8" overhang
EDLUND #1B SS Bench type
BUFFALO #16 SS
BUFFALO #22 Sliding Head

SAWS

MARVEL #9, 10"x10", ball bearing, Hack
PEERLESS 10"x10" Universal Hack
MARVEL #18 Hydraulic Roll stroke Hack, 18"x18"
PEERLESS 14"x14" Hack
CAMPBELL #401 Cutamatic Wet Abrasive Cutting Machine, 6"

GRINDERS

CINCINNATI #3 Centerless; Filmatic
CINCINNATI #4 Centerless; Filmatic
CINCINNATI 6"x30" Plain Hydraulic; Model EA
ABRASIVE #3B Surface
PRATT & WHITNEY 14"x60" Vertical Surface—Hydraulic
BLANCHARD #16 Vertical Surface
BROWN & SHARPE #13 Universal
HAMMOND Type WH Model A Pedestal Grinder
CINCINNATI Type HEA Pedestal Grinder
FOX #8 Swing frame

LATHES—Boring

NILES 30"x50'
NILES 30"x46'

MILLING MACHINES

BROWN & SHARPE #2B—Plain—Timken Bearing
HALL Planetary Millers, Style C & D
BROWN & SHARPE #2 Vertical—Timken Bearing
KENT-OWENS #1M Hand; motor drive; ball bearing
CINCINNATI #3 Univ.—geared

PLANERS

LIBERTY 24"x24"x8'; 1 head on cross rail, 1 side head, A.C. Vari. Voltage Drive

BORING MILLS — VERTICAL

NILES 42", 2 swivel heads, power rapid traverse
NILES 53", 2 swivel heads, power rapid traverse

MISCELLANEOUS

BRINNELL Automatic Direct Reading Hardness Testing Machine
SUTTON #2 Single Head Horiz. Straightening Press, to straighten up to 6½" bar
GREENARD #6 Arbor Press
BLISS #6 Arbor Press

PARTIAL LIST—Hundreds of Other Machine Tools Available

WAR CONTRACT TERMINATION MACHINERY

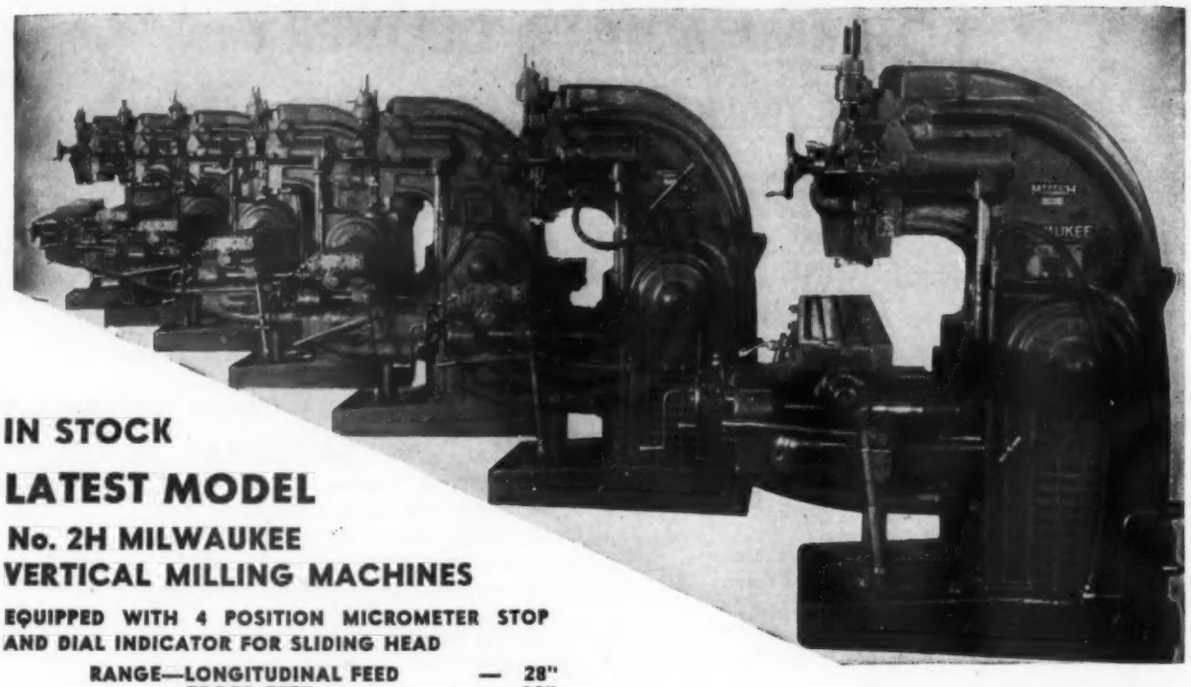
Located at: CRUCIBLE STEEL COMPANY

SOUTH 4th STREET, HARRISON, N. J.

(about 10 miles from New York City)

Sold by: MOREY MACHINERY CO., Inc. **CONTACT: MR. J. SALOWAY, Representative**

AT CRUCIBLE STEEL COMPANY PLANT—Telephone: Harrison 6-4500—Extension 384



IN STOCK

LATEST MODEL

No. 2H MILWAUKEE
VERTICAL MILLING MACHINES

EQUIPPED WITH 4 POSITION MICROMETER STOP AND DIAL INDICATOR FOR SLIDING HEAD

RANGE—LONGITUDINAL FEED	—	28"
CROSS FEED	—	12"
VERTICAL FEED-KNEE	—	15"
VERTICAL FEED-HEAD	—	4"

5 HP 220, 440 OR 550 VOLT, 3 PHASE, 60 CYCLE MOTOR

THEY ARE REAL BARGAINS—
30 DAY MONEY BACK GUARANTEE

HILL-CLARKE
MACHINERY COMPANY
651 Washington Boulevard
Chicago 6, Illinois

DRILL RADIAL—FOSDICK 3½', G.B., M.D.
KEYSEATER—MITTS & MERRILL No. 6, M.D.
MILLER, PLAIN—MILWAUKEE No. 2-B Double Over-Arm, M.D.
PLANER, METAL—WOODWARD & POWELL 30"x30"x8'; 1 rail head, 1 side head.
TURRET LATHES—FOSTER No. 1-B Univ. inc. 2 Wrenches, Chucks, etc. M.D.; also W & S No. 2-A, Univ.
Available immediately—Also Many Other Tools
ALEX ZEEVE & COMPANY
2269 Woolworth Bldg. New York 7, N. Y.

Boring Mills, 36"-42"-52"-72"-96.
Belt Cutters, 1"-1½"-2"-2½" Acme-Landis
Press, Forging 1000 Ton United St.-Hyd.
Planer, 36"x36"x12' Powell 4 Hds.
Planer, O. S. 60"x60"x14' D. & H., M.D.
Planer, 12'x12'x34', 4 Heads, M.D.
Profiler, #13 P. & W., B.D.
Shapers, 16"-20"-24"-36".
Shaper, 36" Morton Draw Cut
West Penn Machinery Company
1210 House Bldg. Pittsburgh, Pa.

HYDRAULICS

200 H.P. Hor. 4 Pl. Motor Driven Pump, Capacity 78 G.P.M. 4000#
2300 Volt Synchronous Motor 3 Phase 60 Cycle
ALSO—75 H.P. Hor. 4 Pl. Pump—50 G.P.M.—2000#
50 H.P. Vert. Triplex Pump—24 G.P.M.—2500#
200 H.P. Horizontal 4 Pl. Pump—200 G.P.M.—1500#
18"x15' Accumulator 1500#
350 ton down moving ram hydraulic press 42" stroke, 28" between rods.
750 ton Waterbury Farrell Lead Extrusion Press.

ACCUMULATORS, PRESSES, VALVES, ETC.
Specialists in Hydraulic Equipment
AARON MACHINERY CO., 45 Crosby St., New York, N. Y.

DRILLS

4'-11" Col. Cinc.-Bickford Super Service, Radial 220/3
5' Western Radial—Mtr. Dr.
Natco D-5 Multiple—Mtr. Dr.
Blanchard #18-36" Vertical Surface Grinder 220/3/60—1942

GRINDERS

Norton Cam-mtr. dr.-late type
Marschke 18" D. E. Ball Bearing Disc-mtr. dr., 1943
Cinc. Centerless Grinder #2—Arr. M.D.
H & G Chaser-excellent condition
Sellers ¼" to 3" cap. drill grinder 1942
B & S #3 Univ. Mtr. Dr.
Porter Cable BG-8 Belt Sander

LATHES

Prentice Bros. 24"x18" Grd. hd-mtr. dr.
Blaisdell 24"x10' LCG-TA
American 14"x8' 2 speed G.H. T.A. Motor-in-base, collets, late type
Prentice 12"x6'—G.H.—Mtr. Dr.
Pratt and Whitney 14"x6' SQCG—TA
Hardinge Prec—on Bench with Equip.

TURRET LATHES

Jones and Lamson 2¼x24" Steel hd—1936 Mfg.
Foster #2 geared head
Warner and Swasey #4 Mtr. Dr.—incl. drive-all-bar equipment
Gisholt 21" Univ.—T.A.

PLANERS

30"x30"x8' Gray 2-head Planer, arr: factory Mtr. dr.
36"x36"x10' Powell Planer, 1 side head, 1 rail head
30"x30"x10' Putnam Planer, 2 head, box bed

MISCELLANEOUS

Cincinnati 24" Duplex Miller—#50 Taper—Mtr. dr.—excellent
#2M Potter and Johnson Miller, Dual table
36" Gisholt Vert. Boring Mill, 2 Hd. Arr: M.D.
#DT 42½B Pels Automatic Beam Shear
#1A Gerton (Pantograph) Engraving machine
48" Apron Folder (power) 14 gauge
72" 14-gauge Dreis and Krump Apron Brake
3000# Chambersburg Beard Drop Hammer

UNITED MACHINERY & TOOL CORPORATION
35 Hermon St., Worcester 8, Mass.

HIGH GRADE TOOLS
FOR EVERY TYPE OF JOB

HEAVY DUTY MACHINE TOOLS PRICED TO MOVE

LESS THAN FIVE YEARS OLD

High Grade Machine Tools Ready to Go to Work

1—10"x72" NORTON Type C. Plain Hydraulic Grinder, A.C. Motor Drive.
16"x24"x96" Mattison Surface Grinder, A.C. M.D.
16"x148" Norton Type C Hydraulic Cylindrical Grinders, A.C. M.D.
3—PRATT & WHITNEY 2 wheel Helical Gear Grinders, new in 1942. A.C. M.D.
6—#16CP16 BRYANT INTERNAL GRINDERS A.C. M.D.
No. 5 Reed Prentice Vertical Milling Machines, A.C. M.D.
1—No. 220 KENT OWENS Hydraulic Plain Mills, A.C. M.D.
3—No. 2 SUNDSTRAND Electro Mills, 24" Table, A.C. M.D.
2—M118 VAN NORMAN Plain Millers, A.C. Motors and Pumps.
5—No. 0-8" CINCINNATI Plain Automatic Millers, A.C. Motor Drive, Pan and pump.
No. 4 Warner & Swasey Universal, Late Type, A.C. M.D.

BORING MILLS

6" Giddings & Lewis Floor Type New in 1942 A.C. M.D. Aux. spindle.
3½" Cincinnati Gilbert Horizontal Boring Mills. A.C. M.D.
5" Sellers Floor Type Boring Mills, A.C. M.D.
36" Bullard New Era Vertical Turret Lathe, A.C. M.D.
61" Bullard Maximill 2 heads, A.C. M.D.

LATHES

36"x36' American 16 Spd. Grd. Head, 2 carriages.
36"x30' Lodge & Shipley Geared Hd., 2 Carriages, Q.C.
36"x18' Putnam Grd. Hd. Q.C.
36"x20' Boye & Emmes, Cone Q.C.
36"x16' American 16 Speed Grd. Hd. A.C. M.D.
27"x16' Lodge & Shipley Sel. Grd. Hd. Taper attachment.
25"x10' LeBlond H.D. Geared Head, A.C. M.D.
24"x20' American Bowl Hd. Cone Q.C.
24"x16' American Geared Head, A.C. M.D.
16"x8' Reed Prentice Grd. Hd. A.C. M.D. Taper.
14"x6' Bradford Cone Drive, Q.C.
12"x30" LeBlond Tool Room, A.C. M.D. New 1942.

MILLING MACHINES

No. 36 Van Norman Vertical, A.C. M.D.
No. 5 Cincinnati High Power Rect. Overarm, A.C. M.D.
No. 4 Cincinnati High Power, Vertical, Power Rapid, A.C. M.D.
No. 3 Cincinnati Vertical H.P.
No. 3A Pratt & Whitney Jig Borer, A.C. M.D.
#3B Brown & Sharpe A.C. M.D. New in 1941.
No. 2 American Milling Machine, A.C. M.D.
No. 0-8 Cincinnati Vertical, M.D. Pump.

GEAR MACHINERY

No. 5R Pfauter Gear Hobbing Machine.
6" Bilgram Bevel Gear Generator.
Lees Bradner Gear Grinder.
No. 1 Schuchart & Schutte Gear Hobber.
6" Gleason Straight Tooth Bevel Generator, M.D.
No. 3 Adams Hobber.

GRINDERS

10"x120" Norton Type C Hydraulic A.C. M.D.
10"x72" Landis Cylindrical Grinder.
18"x85" Crankshaft Grinder, M.D.
10x96 Landis Plain Self Contained.
No. 1 Oliver Drill Grinder.

DRILLS

14" Leland & Gifford Sens.
3' American Radial Sensitive.
6' American Enclosed Head, M.D.
7' American Trip. Purpose, M.D.
6' Cincinnati Bickford A.C. M.D.
7' Cincinnati Bickford.
5'13" Fosdick Pl. Radial Drill, S.P.D.

PLANERS

56"x56"x36' Cincinnati, 4 Heads, A.C. M.D.
60"x48"x24' American H.D. 4 hds.
24"x24"x10' Powell Planer, 2 Heads, A.C. M.D.
24"x24"x6' Whitcomb Blaisdell, 1 Head.

MISCELLANEOUS

No. 2A Warner & Swasey, M.D.
No. 3A Warner & Swasey, M.D.
2¼"x24" J. & L. Turret Lathe.
No. 1½B High Speed Riveters.
½" Rickert & Shafer Radial Tap.
8"x8" Atkins Power Hack Saw.
6"x6" Peerless High Speed Saw.
No. 185 Schmidt Marking Machines.
No. 4 Noble & Westbrook Marking Machine.

CINCINNATI MACHINERY & SUPPLY CO.
217 EAST SECOND STREET — CINCINNATI 2, OHIO

QUALITY *Machine Tools* NOW IN STOCK

★ **No. 61 New Britain, Six Spindle Automatic 1⅝" Bar capacity with chip conveyor and complete tooling; motor driven with motor and controls. New in 1943.**

★ **16" x 33" Fay Automatic Lathe, arranged for chucking, with Logan pump and accumulator, motor driven with motor and controls. New in 1941.**

AUTOMATICS
1" x 5" New Britain Automatic, six spindle.
⅞" Cleveland Model M, four spindle.

DRILLS
★ **4 Ft. Canedy-Otto Radial Drill, motor spindle, 11" column, new in 1942.**
No. 416 Baker, single spindle.
★ **21" Cincinnati-Bickford Direct Motor Driven Drill, single spindle.**
42" Barnes, sliding head.
Allen Sensitive Drill, four spindle.
No. 11 Natco Multiple Drill, 16 spindle.
★ **No. 3 Baush Multiple Drill, 20 spindle, No. 2 Morse taper, rectanguiar head 20" x 40".**

GEAR CUTTERS
No. 61 Fellows Gear Shaper, m.d.
No. 5AC Lees Bradner Gear Hobber.
No. 21 Barber Colman Gear Hobber.
No. 5—48" Cincinnati Automatic Gear Cutter.

GRINDERS
No. 22 Heald Rotary Surface.
76" Rogers Knife Grinder, type B.
No. 72A5 Heald Plain Internal Grinder.
No. 16-26" and No. 16-30" Blanchard Surface Grinder.
No. 72A3 Heald Gagematic Internal Grinder.
No. 70 and 75 Heald Internal Grinders.
No. 13 Brown & Sharpe Universal & Tool Grinder.
10" x 36" Norton Cylindrical Grinder.
10" x 50" Norton Cylindrical Grinder.
No. 2 Cincinnati Centerless.
★ **No. 3 Cincinnati Centerless Grinder, m.d.**

LATHES, ENGINE
★ **20" x 8' Sidney "Monotrol", 8 speed geared head, with taper attachment.**
30" x 12' Schumacher & Boye, c.d.
24" x 30' Lodge & Shipley, g.h.
16" x 6' Hendey, g.h.
★ **8" x 60" Fitchburg Lo-Swing, g.h.**

LATHES, TURRET
★ **No. 4L Gisholt, 9¼" spindle, chucking.**
No. 1A, 2A, Warner & Swasey.
No. 4 Warner & Swasey Universal, c.d.
No. 3 Gisholt, g.h.
No. 6D Potter & Johnston Automatic Chucking and Turning Machine.
★ **42" Bullard VTL, New Era type.**

MILLS
No. 30 Universal Tri-Way Boring Mill, Timken bearing.
No. 4A Brown & Sharpe Universal, s.p.d.
No. 3B Milwaukee Plain, m.d.
No. 4 LeBlond Plain, c.d.
No. 1 Brown & Sharpe Universal, c.d.
No. 0-8 Cincinnati Plain Automatic, m.d.
18" Cincinnati Plain Mfg., s.p.d.
No. 3-36 Cincinnati Hydromatic Duplex, m.d.
4" Pratt & Whitney Spline Mill.
42" Bullard Vertical Boring Mill.

MISCELLANEOUS
No. 3 Long & Allstatter, Multiple Punch, m.d.
Schraner Crankshaft Lapping Machine, Model B.
8" x 7" Troy Vertical Steam Engine.
No. 6 Whiting Stake Riveter.

PLANERS AND SHAPERS
24" American Shaper, c.d.
28" Gould & Eberhardt, s.p.d.
★ **6" Pratt & Whitney Vertical Shaper.**

SAWS
No. 4B Marvel Hack Saw.
9" x 9" Peerless Hydraulic

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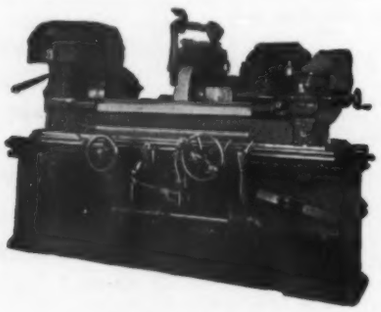
MEXICO OFFICE: Balderas No. 31, Desp. 102, MEXICO, D.F.

HILL-CLARKE *MODERNIZED MOTOR-DRIVEN* GRINDERS
SUPER-GRINDING FOR MICRO-FINISH



SIZES AVAILABLE

10 x 36	14 x 36	18 x 96
10 x 50	14 x 50	18 x 120
10 x 72	14 x 72	24 x 96
10 x 96	16 x 50	24 x 240
	16 x 72	

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651 WASHINGTON BOULEVARD — CHICAGO, ILL.

OTT MACHINERY SPECIALS

AUTOMATICS, Acme 9/16" & 1" Mod. C 5 spdle.
AUTOMATIC, Baird, 6 spindle, M.D.
AUTOMATICS, Gridley, 9/16", ⅞ & 1¼" Mod. G
AUTOMATICS, Cone, 1¼, 2½ & 3½" 4 spdle
CONOMATIC, 1½ & 1⅞"—8 spindle, M.D.
AUTOMATICS, Gridley, ¾, 1¼, 1¾, 2¼" & 2¾, Model F, M.D.
AUTOMATICS, Gridley, 2¼, 3¼, & 5¼" S. S.
AUTOMATICS, Cleveland 1⅛, 1½, 2, 2½, 3½ & 1¾" Model A, M.D.
AUTOMATICS, Cleveland ⅞, 1¼, & 2" Mod. B
AUTOMATICS, Cleveland 3½" 4 spdle, Mod. K4
AUTOMATICS, Potter & Johnston #5a & 6a, M.D.
BULLARD 36" New Era Borg Mill, M.D.
DRILLS, High Speed, B. B. 1 to 6 spindles
GEAR HOBBERS, #3 & 12 Barber-Colman, M.D.
GEAR SHAPERS, #7 High Speed, M.D. & #4
GENERATOR, Gleason Spiral Bevel Gear 10"
GRINDERS, Brown & Sharpe #2 & 3 Universal
GRINDER, Brown & Sharpe #11 Plain, M.D.
GRINDER, Heald #72 Hydraulic, 2 M.D.
GRINDERS, Diamond Surface #2, M.D.
GRINDER, Norton 10"x36" Hydraulic, M.D.
GRINDERS, Landis Hydraulic, 6"x18", M.D.
GRINDERS, Pratt & Whitney 12" Vert. Surface
LATHES, Hendey, E.B.M. type, 14"x7' & 8' M.D.
LATHES, Hendey, 16"x6' & 8' & 18"x10' M.D.
LATHES, Rockford, 18"x8' Geared Head, M.D.
LATHES, Turret, Warner & Swasey #4 G.H. M.D.
LATHES, Morey #3 G. H. Turret, M.D.
LATHES, Lo-Swing 4"x36" Seneca Falls
MILLING MACHINES, #2B Milw. & Vert. Hd.
MILLING MACHINES, Becker Vertical #5 & 6
MILLING MACHINES, Milwaukee #1B Plain & Universal #2 & 3B Plain, M.D.
MILLING MACHINES, #2B Rockford Universal
PLANER, Ohio 42"x42"x10' One Head, M.D.
PLANER-SHAPER, 30" Cincinnati M.D.
TAPPERS, Garvin #2 & 2X M.D.

OTT MACHINERY SALES, INC.
542 Second Avenue
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MONA MEMBER

No. 2 Allen 6-spindle Drill, M.D.
Foote-Burt 5-spindle Drill, M.D.
No. 1 Foster Hand Turret Lathe, M.D.

MONA MEMBER

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JOSEPH HYMAN & SONS
Tioga, Livingston and Almond Streets
Philadelphia, Pa.

KEEP POSTED WITH SIMMONS

BORING MILLS

60" KING, two swivel heads, all geared power feeds, M.D.

72" COLBURN, two swivel heads, all geared power feeds, M.D.

73" NILES-BEMENT-POND, two swivel heads, all geared power feeds, M.D.

84" CINCINNATI Rapid Production Type, one swivel head, one turret head

96" CINCINNATI Rapid Production Type, two swivel heads, M.D.

100" NILES-BEMENT-POND, two swivel heads, all geared feeds, M.D.

120" CINCINNATI Massive Pattern, two swivel heads, M.D.

10/16' CINCINNATI Massive Pattern, two swivel heads and extension boring head.

MILLERS

42" x 26" x 12' INGERSOLL Planer Miller, 4 heads, M.D.

No. 4 CINCINNATI High Power Plain, Power rapid traverse table 16½" x 64". Single pulley belt drive or AC or DC.

No. 4 CINCINNATI High Power Vertical Power rapid traverse. Table 16½" x 64". Single pulley belt drive or AC or DC motor drive.

No. 5 CINCINNATI Plain Rectangular overarm, table overall 21" x 83".

LATHES

30" x 18' LODGE & SHIPLEY Selective geared head, taper attachment.

36" x 30' LODGE AND SHIPLEY 18 speed selective geared head screw cutting engine lathe, 2 carriages. AC or DC motor drive.

42" x 36" PUTNAM Geared Head, 25' between centers. Quick change gear box.

48" x 20' NILES-BEMENT-POND Extra Heavy Geared Head, 11'5" between centers. Power cross and angular feed to compound rest. Semi-quick change gear, taper attachment.

60" x 48' N-B-P Geared Head Engine Lathe.

RADIAL DRILLS

4' AMERICAN Plain triple purpose enclosed head drill, tapping attachment.

5½' AMERICAN Full Universal Triple Geared Tapping Attachment.

6' AMERICAN Triple purpose, plain radial, motor on arm.

GEAR HOBBER

100" GOULD AND EBERHARDT Horizontal for spur, helical and worm gears. Max. capacity 101" diameter. 48" face. Forced feed lubrication.

PLANERS

36" x 36" x 12' CINCINNATI Standard Planer, 2 heads on rail, power elevation to rail, AC or DC motor drive.

120" x 96" x 20' CINCINNATI, Rapid Traverse Planer with 4 heads and 230 V. DC reversing planer motor and control.

72" x 72" x 15' N-B-P Heavy 4 heads, double deck table. 230V, DC Reversing motor drive.

16' x 10' x 30' BETTS Heavy, 2 heads on rail and 2 side heads, forced feed lubrication. 230 V DC reversing type planer, motor and control.

SLOTTERS

6" & 10" PRATT & WHITNEY Vertical Shaper with rotary table, power feeds, tilting ram. AC or DC motor drive.

15" NEWTON Crank Slotter, 30" circular table, AC or DC.

MISCELLANEOUS

30' No. 3 HILLES & JONES Plate Edge Planer.

30' x ⅜" NBP Bending Rolls, pyramid type.

No. 2 PRATT & WHITNEY Jig Borer with 22" x 44" table.

ENGINEERED Machine Tool REBUILDING

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N. Y. OFFICE: 50 EAST 42nd STREET, NEW YORK 17, N. Y.

SIMMONS *Engineered* REBUILDING

FOR SALE

2—1⅝" Cone Automatic

Screw Machines,

Motor Driven,

8-Spindle Type.

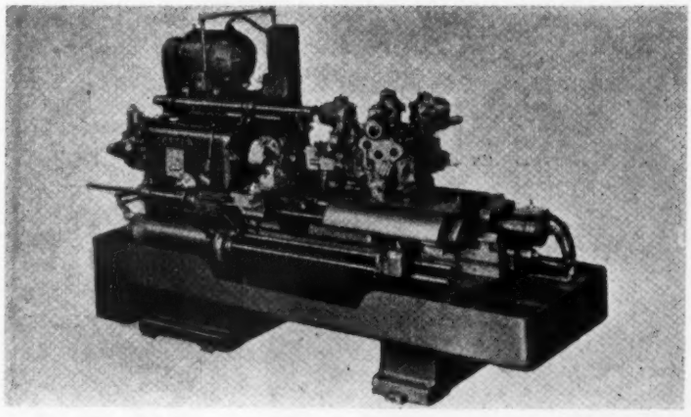
REYNOLDS MACHINERY CO.

305 Eddy Street

PROVIDENCE 3, R. I.

Gaspee 5187

NINE — No. 2FU FOSTER FASTERMATIC UNIVERSAL TURRET LATHES



New 1940-41. Serials FU113 plus. Cost with accessories $12,840 each. Motor driven with 7½ H.P. motors, 220/440 volt, 60 cycle, 3 phase. With quantity of extra equipment: air cylinders, pilot heads, bars, bushings, angle holders, etc. Excellent condition. Price **$3750.00** each

J. L. LUCAS & SON, INC.

BRIDGEPORT 5, CONN. **Telephone 9-3393**

FOR SALE

14" P & W B.B. Vertical Surface Grinder, magnetic chuck, motor drive.

3-4" Rice Barton Spline Mills, M.D., new 1941.

F. HOWARTH & SON

517 MARKET STREET NEWARK 2, N. J.

TURRET LATHE TOOLS

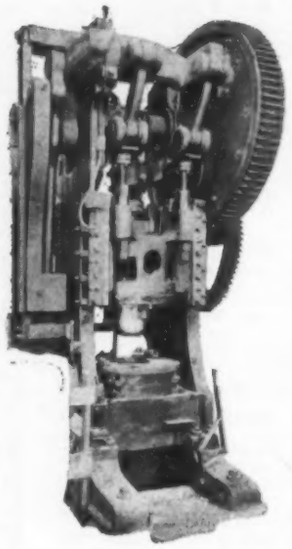
For IMMEDIATE Delivery

SUITABLE for 1", 1½" and 2" CAPACITY TURRET LATHES

Ask for Catalog 943

MOREY MACHINERY CO., INC.

410 BROOME STREET, NEW YORK 13, N. Y.



IN STOCK

LATHES

48"x24' Blocked to 80" Fifield, D.B.G.
46"x20' h.e. Niles, 2 carriages. G.H. M.D.
36"x14' Niles. Q.C. G.H. M.D.
30"x17' Blocked to 58" Houston, Q.C. M.D.
16"x6' & 12"x6' Monarch, M.D. Late type
Many others from 7" to 90" swing. Niles, Lodge & Shipley, American, Monarch, Hendey, Lebland, South Bend, Logan, etc.

TURRET LATHES

4½" Bardons & Oliver. Bar feed. M.D.
3"x36" Jones & Lamson
#3, #4, #5, #2A, #3A Warner & Swasey
Many others from ⅝" to 6" capacity

PLANERS

60"x60"x20' Gray, 4 heads. M.D.
40"x40"x12' Cincinnati, 2 heads
30"x30"x10' Powell. 2 heads. M.D.
36"x18' Dietrich & Harvey. Open Side. 2 heads. M.D.

BORING MILLS

2½", 3½", 4", 5" Horiz. Binsee, Universal, Bausch
24" to 10' Vertical Bullard, Niles, Cincinnati, Betts, etc.

SHAPERS

7" to 32" Rhodes, Smith & Mills, Gould & Eberhardt, Stockbridge, Walcott, etc.

MILLERS

36"x36"x10' Ingersoll, planer type, 4 heads, M.D.
#2 SU Van Norman Universal, M.D.
#2, #3, #4 and #5 Universal M.D. Cincinnati, Brown & Sharpe, Milwaukee, Hendey
#2A Milwaukee, Plain. M.D.
#4 Milwaukee, Plain, M.D.
#3 Cincinnati, Plain, M.D.
#08 Cincinnati, Vertical, M.D.
#2 and #3 Brown & Sharpe, Vertical, M.D.
Brown & Sharpe and Cincinnati Production Millers, M.D.

AUTOMATICS

#00, #0, #2 Brown & Sharpe
2", 2½", 2¾" Cleveland, M.D.
Gridleys, New Britains—latest models

GRINDERS

Cylindrical, Plain and Universal, Landis, Norton, Brown & Sharpe
#2 and #5 Brown & Sharpe, Reid, Sanford, etc. Surface
#2 Cincinnati Centerless
Brown & Sharpe, Gallmeyer & Livingston, Cincinnati Universal Tool
#70 Heald Internal, M.D.
Pratt & Whitney and Springfield Vertical Surface

PUNCH, SHEARS

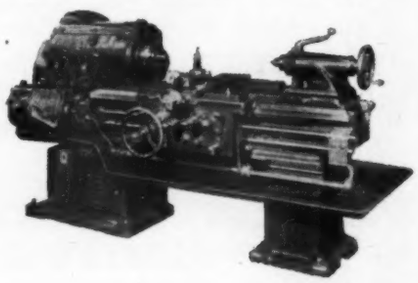
Bliss, Adlerhurst, Long & Allstatter, Excelsior, etc.

HAMMERS, PRESSES & OTHER FORGING EQUIPMENT

¼" to 8" Upsetters. Ajax, Waterbury
Hydraulic Presses, 250 to 3000 tons. Wood, Watson-Stillman, HPM, Farnham, Oil Gear Co. etc.
Mechanical Power Presses, up to 2000 tons. Ferracute, Toledo, Bliss, etc.
2000 ton HPM Turret Type Heading Press
#60¼ Toledo Power Press, 1200 ton
#57 Toledo Press, 100 ton
#78½ Bliss Press
#5 Bliss Toggle Press
#6 Bliss Press, and many others
Steam Hammers from 100# to 35,000# Erie, Chambersburg, Niles, etc.
Many Waterbury-Farrell Presses

MISCELLANEOUS

New #510 Campbell Abrasive Cutter, 10"x12'
Bliss & Rafter Forming Rolls
Do-All Saws, Model V-26, M.D.
Many other special machines.

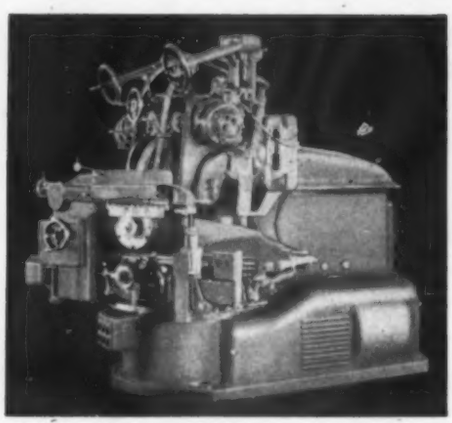


This is a partial list. Complete plants for sale or installed. Terms arranged.

S. & S. MACHINERY COMPANY
207 CENTRE STREET NEW YORK 13, N. Y.

---

3 Almost New PRATT & WHITNEY Gear Grinders
2-Wheel Type, for SPUR and SPIRAL Gears 10" Model



These machines were new in 1941, and they are in condition EQUIVALENT TO NEW. They are complete with 220/440 motors, controls, work locating device, tank, pump, etc. Their price was over $14,000 each. We can sell them at

ONLY

$3,700.00

EACH!

Capacity: 10-11/16" diameter, #3 diametral pitch, helix angle up to 45°. Net weight about 10,000 lbs.

LAURENS BROS. 2780 Highland Avenue Cincinnati 12, Ohio

10½' L & A Plate Shear
Type G

1⅛" capacity, 36" Gap
M.D.

AARON MACHINERY CO.
45 CROSBY STREET NEW YORK, N.Y.

#2-F, #3-F Fastermatic Turret Lathes. 450 ton and 350 ton Toledo Punch Presses
2½" to 4" bar Horiz. Boring Mills, 1 yr. old, $6,000.00 up.
5" Bar Newark Horiz. Boring Mill, 8' Bed, M.D., $2250.00
#17 Barber Colman Heavy Duty Gear Hobber, can take a hob up to 5¼" dia.
8', 16' Bullard Multamatics, 1 yr. old
#4½ & #6 Bliss Punch Press, 100 ton cap. 1 yr. old
Quick Change Gear Lathes, $125.00 up complete
10x36, 16x88, 15x144" Ext. Grinders

PAUL'S MOTOR AND MACHINERY SUPPLY CO.
MDNA MEMBER
Detroit 8, Mich.
6111 Vermont Ave.
Tyler 76300

SHEET METAL MACHINERY
NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders
MDNA MEMBER
B. D. BROOKS, INC.
361 Atlantic Ave., Boston, Mass.

FOR SALE
600 TON HYDRAULIC PRESS
Watson Stillman rebuilt 48" single daylight opening downward double acting ram 16" dial by 21" stroke, platen 24"x24" with clear space left to right 30¾" between 5½" dia. strain rods. We will purchase your Surplus Equipment.
UNIVERSAL HYDRAULIC MACHINERY CO.
285 Hudson Street New York, N. Y.

NEW—USED
MACHINERY
and EQUIPMENT
LARGE STOCK ON HAND
Hasco MACHINERY COMPANY
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NEWARK 3, N. J. BIGELOW 3-3486-7-8

IN STOCK

LATHES

16"x8' Lodge & Shipley Selective Geared Head
18"x8' Lodge & Shipley
36"x30' Lodge & Shipley Triple Geared Selective Head, two carriages

DRILLS

5' Fosdick Radial, motor drive

MILLING MACHINES

No. 2-H Milwaukee Vertical, latest type
No. 4-B Milwaukee Vertical
No. 4 Milwaukee Heavy Plain, Timken bearing
No. 118 Van Norman Production
26"x25"x12' Ingersoll Adjustable Rail
42"x36"x18' Ingersoll Adjustable Rail, four heads

PLANERS

36"x36"x8' Woodward & Powell
60"x38"x8' Gray Spiral Geared

TURRET LATHES

6.2" Denver, chucking machine
Denver Type 6-R, A.C. and B.F.
18" Libby, 3½" H.S.
No. 4, No. 6 Warner & Swasey, A.C. and B.F.

MISCELLANEOUS

No. 24-HS Gould & Eberhardt Gear Hobber
No. 72 Heald Internal Grinder
No. 27-MB Smalley-General Thread Miller
No. 6 Lees-Bradner Thread Miller

HILL-CLARKE MACHINERY COMPANY
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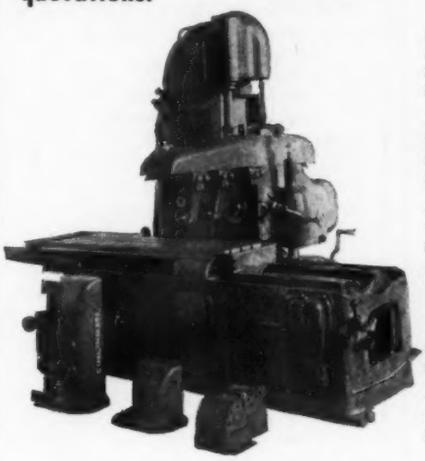

Cin. 5-48 Pl. Hydromatic Miller (actual photo), long. tbl. feed 48", tbl. wkg. surf. 20"x66½", max. dist. top tbl. cen. of arbor 13⅞", min. 5⅞", very latest type, comp. with AC elect. equip., net wght. 15,000 lbs.

1—Amer. 3', 9" col., hi-speed Pl. Radial Drill, motor on arm type, No. 4 Morse Taper, AC elect. equip., box tbl., mtzd. coolant pump and piping.

1—Warner & Swasey No. 4 Univ. Turret Lathe, 12 speed, grd. hed., M.D., arr. for bar, sw. over bed 16", max. lgth. turn. 10", bar capac. 1½".

1—Heald 72A3 Pl. Hyd. Int. Grinder, 2 Motor Drive, sw. over tbl. 15½", max. diam. hole ground 7½", max. stroke hed. 8⅝".

Heald 72A5 Hyd. Int. Grinder, Ser. No. over 21,700, very lat. type, comp. equip., 2 Red Hed. spins., workhead collet fix., AC elect. equip., extra tbl. length., capac. sw. over tbl. 28", sw. over bridge 60½", diam. and lgth. hole ground 8½" stand., max. grinding stroke 20⅝", extended bridge type.

1—Heald 72A5 Pl. Hyd. Int. Grinder, M.D., 3 motor drive, Ser. No. over 4200, AC elect. equip., Red Hed. spin.

Colburn 48" Vert. Bor. Mill, M.D., capac. 49½" diam. x 44" hght. under cross rail, 2 swiv. heds. on cross rail, power rapid trav.

1—Gisholt 52" Vert. Bor. and Turning Mill, M.D., 54" diam. x 42" height under cross rail, comp. with right hand swiv. and left hand turret hed. on cross rail, horiz. and vert. rapid trav. to heds.

1—Bullard 42" New Era Type Vert. Boring and Turning Mill, M.D., Ser. No. 10964, capac.: 44" diam., 33" high under cross rail, comp. with 3 jaw chuck tbl., side hed.

4—Peerless 6"x6" hi-speed Univ. Saws, very latest type, hydraulic down feed, AC elect. equip., air operated vises.

Nat'l. Red Ring 8" Gear Shaver, M.D. very lat. type, Ser. No. over GC1-570.

1—Cin. No. 2-36 Sin. Ram. Vert. Hydro Broach, max. stroke ram. 36", max. broach. lgth. 32", normal broach. force 5000 lbs., tbl. wkg. surf. 13"x19¾".

1—LaPointe 2L Broach, normal pulling capac. 15,000 lbs., max. str. 48", diam. hole in face plate 5", excell. cond., used only slightly.

1—Amer. 18"x10', 8 speed grd. hed., Eng. Lathe, M.D., sw. over bed 20½", dist. betw. cens. 67".

1—L. & S. 18"x8', 12 sp. select. grd. hed., pan bed, M.D., Eng. Lathe, sw. over bed 20¼", dist. betw. cens. 48", taper attmt., AC elect. equip., long. mfg. stops, coolant pump and piping.

1—L. & S. 24"x30' select. grd. hed., QCG, pan bed, Eng. Lathes, M.D. dist. betw. cens. 24' sw. over bed 28½".

1—Hendey 16"x9' yoke hed., QCG, Eng. Lathe, M.D., sw. over bed 16½", dist. betw. cens. 64".

1—B. & S. No. 3B Heavy Duty Pl. Mill. Machine, dbl. overarm type, AC motors in base, Ser. Nos. over 1630, tbl. wkg. surf. 55"x18", range power feeds: long. 54", cross 12", vert. 20".

3—Van Norman 3V Vert. Mill. Machines, Ser. Nos. over 5100 M.D., tbl. wkg. surf. 64"x14", range feeds: long. 34", cross 12", vert. 18", vert. trav. of hed. 5", No. 50 Nat'l. Stand. Taper.

1—Van Norman No. 21 Dup. Miller, Ser. No. over 12,900, M.D., AC motor in base, tbl. wkg. surf. 45"x11⅝", range feeds: long. 27½", cross 10¾", vert. 19¼".

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#2KM Kearney & Trecker Plain Miller
#18 Blanchard Surface Grinder 36" Chuck
#36 Hanchett Surface Grinder 40" Chuck
#2 Brown & Sharpe Wire Feed Hand Screw Machine
#1 Brown & Sharpe Universal Cylindrical Grinder

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Dust Collector
Grinder, 12" Arter Rotary, M.D.
Grinder, Bryant Internal No. 3, M.D.
Grinder, Cincinnati Universal 12x72
Lathe, LeBlond Multi-Cut No. 6, M.D.
Mill, hand, Kent Owen No. 1, M.D.
Mill, Rockford Rigidmil, M.D.
Mill, Toledo Vertical No. 3V, M.D.
Niagara Board Drop Hammer 200 lbs.
Shaper, Hamilton 24", M.D.
Turret Lathe, No. 3 Bardons & Oliver full universal, extra tooling, M.D.
Turret Lathe, No. 4 Bardons & Oliver, M.D. with drive-all.
Turret Lathe, Warner & Swasey, No. 2, chucking machine, motor in base

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10x36" Cincinnati Hydraulic, m.d., very late
10x48" Brown & Sharpe
10x48" Landis Type C Hydraulic, m.d., latest
10x48" Norton Type C Hydraulic, m.d., latest
10x72" Landis, m.d.
10x72" Norton m.d., latest, raised to 14"
12x36" Landis, m.d.
12x36" Modern, belt
12x36" Modern, m.d.
12x42" Modern, belt
12x42" Landis, belt
12x48" Cincinnati Self-Contained, m.d.
12x72" Brown & Sharpe No. 16, belt
12x96" Landis, m.d.
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14x48" Cincinnati Self-Contained, m.d.
14x52" Norton Type A, motorized
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16x216" Landis Type B Hydraulic, m.d., latest
20x120" Landis Self-Contained, with gap m.d.
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No. 9 Cincinnati, belt
No. 16-22" Bryant Hydraulic Hole, m.d., latest
No. 16RS Bryant, m.d., latest
No. 24-20" Bryant Hydraulic Hole, m.d.
No. 72A3 Heald Gagematic, m.d.
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3' American Sensitive, belt
3' American Triple Purpose, m.d. on arm, 9" col.
3' American Triple Purpose, with 4' arm and base, m.d. on arm
3' American Triple Purpose, 11" column dia. m.d. on arm
3'-11" Carlton, m.d. on arm, two way base, latest type
3' Foodick Sensitive, belt
4' American Triple Purpose, m.d. on arm
4'-11" American Hole Wizard, m.d., on arm, latest
4'-11" Carlton, m.d. on arm, latest
4'-13" American Hole Wizard, m.d. on arm, latest
4' American Triple Geared, m.d.
4'-11" Cincinnati-Bickford, m.d.
4'-11" Cincinnati-Bickford, m.d. on arm
4' Cincinnati-Bickford, m.d. thru gear box, 13" dia.
4'-15" Cincinnati-Bickford Super-Service, m.d. on arm
4' Foodick, 12" col., gear box
4' Niles-Bement-Pond Semi-Universal, m.d.
5' American Triple Geared, 13" col., m.d.
5'-15" Cincinnati-Bickford Super-Service, m.d. on arm
5'-13" Cincinnati-Bickford, gear box on base
5' Cincinnati-Bickford Plate Hole Driller, m.d.
5'-13" Dreses, gear box
5' Prentice Plain, m.d.
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6'-17' American Hole Wizard, m.d. on arm, railroad type base, latest
6'-15" Carlton, m.d., two way base
6' Cincinnati-Bickford Full Universal, gear box
6' Niles-Bement-Pond Semi-Universal, m.d.
6' Western, 16" col., gear box
6' Reed-Prentice, m.d.
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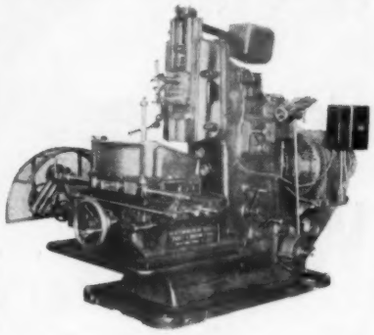

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30 Ton Niles 53'9" Span
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30 Ton Reading 56' Span
25 Ton Bedford 50' Span
25 Ton Cleveland 106' Span
25 Ton P & H 70' Span
25 Ton Whiting 106' Span
25 Ton Whiting 82' Span
25 Ton Whiting 56' Span
20 Ton Alliance 77' Span
20 Ton Cleveland 65' Span
20 Ton Morgan 77' Span
20 Ton Northern 60' Span
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20 Ton Shaw 76'4" Span
20 Ton Shepard Niles 49'8" Span
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15 Ton Alliance 50' Span
15 Ton Alliance 35' Span
15 Ton Cleveland 55'6" Span
15 Ton Cleveland 35' Span
15 Ton Morgan 77' Span
15 Ton Niles 32' Span
15 Ton Northern 53' Span
15 Ton Shaw 82' Span
15 Ton Shaw 77' Span
15 Ton Toledo 82' Span
15 Ton Whiting 74'8½" Span
15 Ton Whiting 71'10½" Span
12 Morgan 56' Span
10 Ton Alliance 53'8" Span
10 Ton Alliance 71'10" Span
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10 Ton Cleveland 38' Span
10 Ton Cleveland 50' Span
10 Ton Emsco 30' Span
10 Ton Lane 50' Span
10 Ton Morgan 39'5" Span
10 Ton Morgan 77' Span
10 Ton P & H 57' Span
10 Ton P & H 78' Span
10 Ton P & H 87'6" Span
10 Ton Northern 34' Span
10 Ton P & H 49'10½" Span
10 Ton P & H 60' Span
10 Ton P & H 80' Span
10 Ton Shaw 68' Span
10 Ton Shaw 58' Span
10 Ton Shaw 88' Span
10 Ton Northern 71'10½" Span
7½ Ton Erie 70' Span
7½ Ton P & H 30'6" Span
7½ Ton Scullin 71'10½" Span
7½ Shepard 36' Span
6 Ton Shaw 23' Span
5 Ton "American" 10' Span
5 Ton Champion 37'6" Span
5 Ton Euclid
5 Ton Milwaukee 39'8" Span
5 Ton Milwaukee 66'9" Span
5 Ton Milwaukee 70' Span
5 Ton Northern 49'6" Span
5 Ton P & H 45' Span
5 Ton Shaw-Box 25' Span
5 Ton Shepard 40' Span
5 Ton Toledo 96' Span
5 Ton Whiting 80' Span
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3 Ton Shaw 33" Span
3 Ton Whiting 57'3" Span
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2 Ton P & H 46'4" Span
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1 Ton Curtis 24' Span

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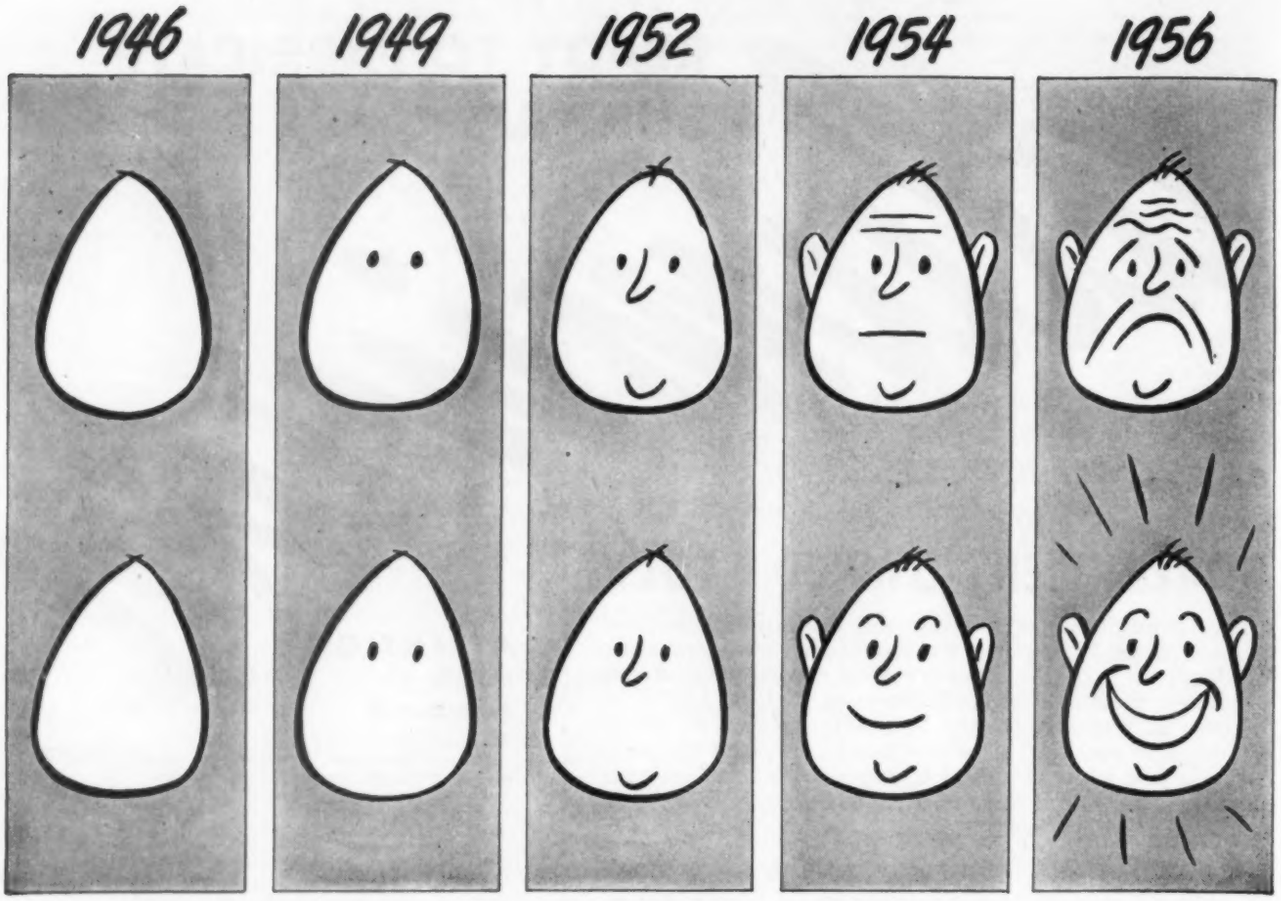

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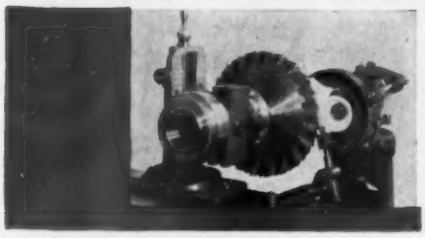

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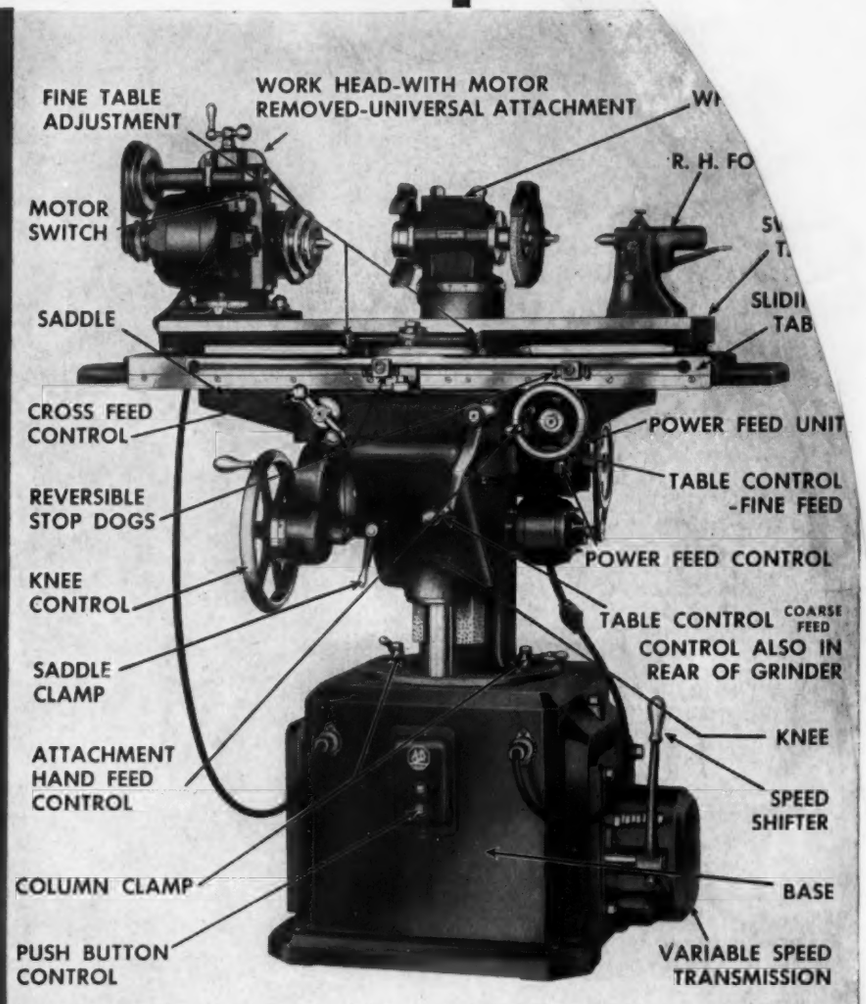

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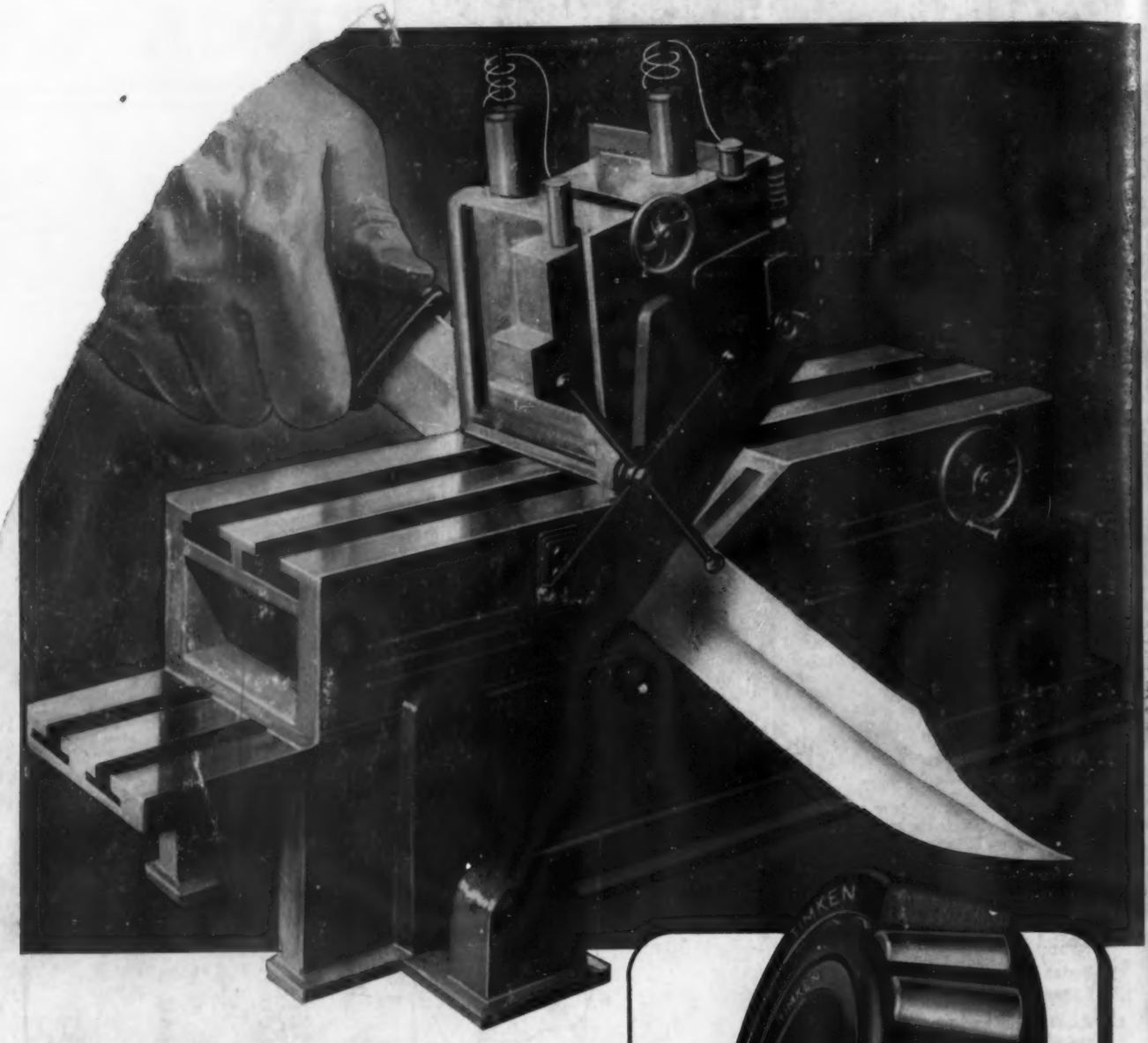

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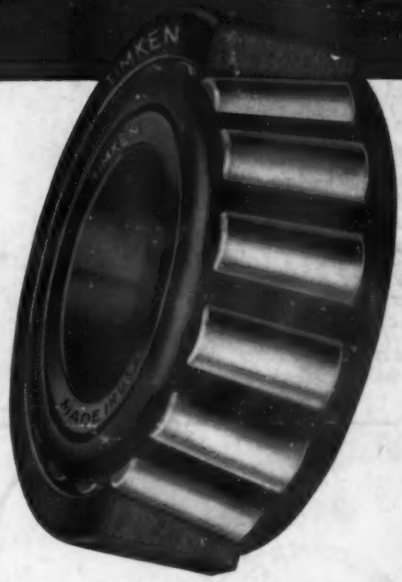

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